QUEENSLAND
COURTS

CORONERS COURT OF QUEENSLAND

Inquest into the deaths of Kate Goodchild, Luke Dorsett, Cindy Low & Roozbeh Araghi at Dreamworld, October 2016

Findings and Recommendations
February 2020

CORONERS COURT OF QUEENSLAND

INQUEST INTO THE DEATHS OF KATE LOUISE GOODCHILD, LUKE JONATHAN DORSETT, CINDY TONI LOW, & ROOZBEH ARAGHI

Coroner, Southern Region

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QUEENSLAND COURTS

CORONERS COURT OF QUEENSLAND

FINDINGS OF INQUEST

CITATION:	**Inquest into the deaths of Kate Louise GOODCHILD, Luke Jonathan DORSETT, Cindy Toni LOW, & Roozbeh ARAGHI**
TITLE OF COURT:	Coroners Court
JURISDICTION:	SOUTHPORT
FILE NO(s):	2016/4486, 2016/4485, 2016/4480, 2016/4482
DELIVERED ON:	24 February 2020
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HEARING DATE(s):	18 June 2018 to 29 June 2018 8 October to 19 October 2018 12 November to 22 November 2018 6 & 7 December 2018
FINDINGS OF:	James McDougall, Coroner
CATCHWORDS:	Coroners: inquest, **Dreamworld, amusement device, Theme Park, safety management systems, ride maintenance, training, amusement device regulation, amusement device designer, amusement device modification, external safety audits.**
REPRESENTATION:	
Counsel Assisting	Mr Ken Fleming, QC Ms Rhiannon Helsen, CCoQ
Family of Cindy Low	Mr Matthew Hickey, Counsel instructed by Clayton Utz

Families of Kate Goodchild & Luke Dorsett

Mr Steven Wybrow, Counsel instructed by Aulich Civil Law

Family of Roozbeh Araghi

Mr Toby Nielsen, Counsel instructed by Gordon & Barry Law

Mrs Kim Dorsett (mother, Kate & Luke)

Mr Robert Davis, Counsel instructed by Sneddon, Hall & Gallop Lawyers

Office of Industrial Relations (Workplace Health & Safety Queensland)

Mr Stephen Gray, Counsel instructed by Crown Law

Ms Courtney Williams

Mr Peter Callaghan SC, instructed by Gilshennan & Luton

Ms Chloe Brix, Ms Sarah Cotter, Mr Wayne Cox,
Ms Amy Crisp, Mr Generic Cruz, Mr Francoire De Villiers,
Mr Christopher Deaves, Mr Quentin Dennis, Mr Andrew Fyfe,
Mr Peter Gardner, Mr Mark Gordon, Ms Nichola Horton,
Mr Jason Johns, Ms Jennie Knight, Mr John Lossie,
Mr Troy Margetts, Mr Steven Murphy, Mr Grant Naumann,
Mr Peter Nemeth, Mr Kamlesh Prasad, Mr Scott Ritchie,
Mr Matthew Robertson, Mr Michael Stead,
Mr Mark Watkins, Mr Timothy Williams, Mr Jacob Wilson

Mr Ralph Devlin QC & Mr Liam Dollar, Counsel instructed by K & L Gates LLP

Ardent Leisure Ltd trading as Dreamworld

Mr Bruce Hodkinson QC & Mr James Bell QC, instructed by Baker McKenzie Lawyers & DWF (Australia)

CEO, Dreamworld, Craig Davidson

Mr Gavin Handran, Counsel instructed by Quinn, Emanuel, Urquhardt & Sullivan LLP

Queensland Police Service

Mr Adrian Braithwaite, Counsel instructed by QPU Legal Group

DANFOSS Australia (Mr Eduardo Gie)

Mr Sean Farrell, Counsel instructed by Mills Oakley

Mr John Clark, Mr Shane Green, Mr Benjamin Hicks,
Mr Nigel Irwin, Ms Rebecca Ramsay, Mr Mark Thompson

Mr Anthony Harding, Counsel instructed by Rankin & Co Lawyers

Mr Angus Hutchings

Mr Craig Eberhardt, Counsel instructed by Robertson O'Gorman Solicitors

Mr Tom Polley (Danski Pty Ltd)

Ms Polina Kinchina, Counsel instructed by Colin, Biggers, Paisley Lawyers

Mr Bob Tan

Mr John Bremhorst, Counsel instructed by Australian Business Lawyers & Advisors

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INTRODUCTION

1. At around 2:05 pm on 25 October 2016, a tragic incident occurred on the Thunder River Rapids Ride (TRRR) at Dreamworld Theme Park, Coomera, which claimed the lives of Ms. Kate Goodchild, Mr. Luke Dorsett, Ms. Cindy Low and Mr. Roozbeh Araghi. A joint inquest into the circumstances of this tragedy was convened over a six-week period at various dates in June, October, November and December 2018, in the Coroners Court of Queensland at Southport.

2. The gravity, complexity and scope of this tragedy at Australia's largest Theme Park was reflected in the comprehensive and professional investigations conducted by the Queensland Police Service (QPS) and the Office of Industrial Relations, formerly Workplace Health and Safety Queensland (OIR), as well as the voluminous documentary, photographic and video exhibits obtained during the course of the inquiry. During the hearing, oral evidence was taken from 59 witnesses, with an expert engineering conclave convened to provide evidence concurrently.

3. The impact of this tragedy on the community, whilst paling in comparison to that on the loved ones of those who lost their lives, has been undeniably significant. Accordingly, the in-depth nature of this inquiry was intended to ensure that such a tragic event does not happen again.

4. I would like to commend the work of all of those involved in the investigation of this tragic incident. The investigation was conducted to an exceptionally high standard, with a great deal of compassion, expertise and dedication by the Queensland Police Service and Office of Industrial Relation (OIR) officers involved. The gravity, scope and complexity of this tragedy at Australia's largest Theme Park is unparalleled in Queensland's history, and was carried out to a remarkable standard under great public scrutiny, with the eyes of the world watching.

5. Whilst the investigation and ongoing preparation of this inquiry was certainly collaborative, I would like to make particular commendations to the following Queensland Police Investigators for their remarkable efforts.

6. I am grateful for the tireless and outstanding work undertaken by Detective Sergeant Nicola Brown, the lead investigator for this tragic incident. Her standard of work and dedication has been exceptional, and of great assistance to my inquiry. The task of investigating such a unique and high-profile incident was immense, and undertaken by Detective Sergeant Brown in a professional, diligent, compassionate and comprehensive manner. I am thankful for all her efforts during the course of these proceedings.

7. The skillful and detailed analysis conducted by Senior Constable Steven Cornish, the lead Forensic Crash Unit Investigator, with respect to the mechanical and technical aspects of this tragedy was pivotal to this inquiry. His dedication and attention to detail ensured that this unique and catastrophic incident was properly, and with the requisite expertise, investigated and considered. I am grateful for all his tireless work and commitment.

ISSUES FOR INQUEST

8. On 3 April 2018 and 25 May 2018, at pre-inquest hearings, the following issues for the inquest were determined:

    a. The findings required by s.45 (2) of the *Coroners Act 2003*; namely the identity of the deceased person, when, where and how they died and what caused the death.

    b. The circumstances and cause of the fatal incident on the Thunder River Rapids Ride at the Dreamworld Theme Park, which occurred on 25 October 2016.

    c. Examination of the Thunder River Rapids Ride at the Dreamworld Theme Park, including but not limited to, the construction, maintenance, safety measures, staffing, history and modifications.

    d. Examination of the sufficiency of the training provided to staff in operating the Thunder River Rapids Ride.

    e. Consideration of the regulatory environment and applicable standards by which Amusement Park rides operate in Queensland and Australia, and whether changes need to be made to ensure a similar incident does not happen in the future.

    f. What further actions and safety measures could be introduced to prevent a similar future incident from occurring?

ABOUT THE DECEASED PERSONS

9. Ms. Kate Louise Goodchild was born on 3 August 1984 in Canberra. She resided with her partner of 15 years, David Turner, and their two children, Ebony and Evie in Ngunnawal, ACT. She was a dedicated wife and mother, who had a wonderful sense of humour.[1] She had three siblings, Luke Dorsett, Jeremy Goodchild and Peta Harrison. At the time of her death, Ms. Goodchild worked for the Department of Human Services, having previously worked in various public service and private organisations.

10. Mr. Luke Johnathan Dorsett was born on 28 March 1981 in Canberra, and is Ms. Kate Goodchild's older brother. He resided with his adored partner of 10 years, Mr. Roozbeh Araghi in the ACT. He worked for the Department of Human Services. Like his sister Kate, Mr. Dorsett was dedicated to his role in the public service and had an immense work ethic. He was described as an extraordinary role model to those around him.[2]

11. Mrs. Cindy Toni Low was born in Whakatane, New Zealand on 19 May 1974. She and her husband, Mr. Mathew Low travelled to Sydney and settled there in 2001. They had two children, Keiran Elijah Low and Isla Grace Low. Mrs. Low was a dedicated wife and mother, who was described by her family as vibrant, intelligent and social.[3] She lived at East Gosford and worked as a personal assistant at a property valuation company.

[1] Ex B1, pg. 11
[2] Ex B1, pg. 12
[3] Ex B1, pg. 11

12. Mr. Roozbeh Araghi was born on 7 September 1978 in Iran to parents Behrooz Araghi and Vivien Hadden Araghi. He had two siblings, Simon Sirus Araghi and Darius Araghi and was the father of Zachary Araghi Dawson and Harrison Araghi Dawson. He resided in the ACT with his loving partner of 10 years, Mr. Dorsett. He held a Bachelor of Arts (Honours) from Sydney University and worked for the Australian Bureau of Statistics. He was known amongst his friends and colleagues as a *'tireless defender of the under privileged'.*[4]

BRIEF SUMMARY OF THE INCIDENT

13. On Tuesday 25 October 2016, Dreamworld opened as usual at 10:00 am. The Thunder River Rapids Ride (TRRR) commenced operating with nine rafts in circulation and two Ride Operators. This is the maximum number of rafts allowed in circulation for a two Operator model.[5]

14. At around 2:00 pm on 25 October 2016, Cindy Low and her son Kieran, Kate Goodchild and her daughter Ebony Turner, along with Kate's brother, Luke Dorsett and his partner Roozbeh Araghi, boarded Raft 5 of the TRRR. At the time, the weather was dry and clear.

15. The TRRR, which is no longer in commission, was an aquatic based family orientated 'moderate thrill ride', which was suitable for patrons over the age of two. It was designed to simulate white water rafting for six patrons, with the option of having three children seated on an adult's lap, within a circular raft. Statistically, it was the most popular ride in the Theme Park.[6]

16. Raft 5 travelled through the water course without incident before being picked up by the conveyor at the end of the ride and moved towards the elevated unloading area. At this time, Raft 6, which was dispatched in front of Raft 5, became stranded on the steel support rails situated at the end of the conveyor near the unloading area. Raft 5 continued to travel on the conveyor where it collided with Raft 6 before being lifted and pulled vertically into the conveyor mechanism. Ebony and Kieran, who were seated at the top of Raft 5, were able to free themselves and escape to safety. Ms. Goodchild, Ms. Low, Mr. Dorsett and Mr. Araghi were caught in the mechanism of the ride, and were either trapped in the raft or ejected into the water beneath the conveyor.

17. The Ride Operators and some patrons immediately responded to the incident, attempting to assist those trapped in the raft and in the watercourse. Emergency services were contacted, and various Dreamworld staff responded to the incident. Unfortunately, all attempts to provide medical assistance to Ms. Goodchild, Mr. Dorsett, Ms. Low and Mr. Araghi were unsuccessful, and they were declared deceased at the scene.

18. A major investigation code named *'Operation Oscar Holocene'* was immediately commenced by QPS, which included support from various internal specialty units, including the Forensic Crash Unit, who carried out testing and an expert analysis of the scene and circumstances of the incident. Given the scale of the investigation and nature of the incident, support was also provided by the State Crime and Intelligence, Counter-Terrorism and Major Events Command.

[4] Ex B1, pg. 12
[5] Ex B1
[6] Ex B3C(50), pg. 20

19. The scope of the QPS investigation was twofold. Firstly, to determine whether there was any criminal negligence or criminal responsibility under the *Criminal Code 1899,* and also to identify, report and obtain evidence, which could assist the South Eastern Coroner in his investigation of the incident, establish a cause of death, make the requisite findings under the *Coroners Act 2003* and identify any possible preventative recommendations. In addition to undertaking an expert forensic examination and search of the incident scene, a multitude of witnesses were interviewed, including eye witnesses, Ride Operators, Dreamworld management staff, maintenance workers, current and former Dreamworld employees, Queensland Ambulance Service (QAS) officers, and Dreamworld patrons. Relevant evidence from the scene was seized, extensive photographs of the incident site taken, and various external and internal subject matter experts were engaged in order to comprehensively canvas all of the pertinent issues associated with the tragedy, and to ensure a thorough and expert analysis was conducted of the incident and scene.

20. Due to the nature of the coronial investigation, its gravity and scope, OIR, whilst undertaking their own separate statutory investigation, assisted QPS in examining the incident. Various interviews and evidence was obtained pursuant to s.171 of the *Work Health and Safety Act 2011,* for an array of potential witnesses, who refused to provide voluntary statements to QPS, however, were highly relevant to provide context, evidence, information regarding training, maintenance, safety and the history of the TRRR.

21. The OIR investigation into the circumstances of the tragedy was also extensive, and various professionals and experts were employed to provide comment as to components of the incident, the ride and regulatory history. OIR officers attended site immediately following the incident and continued to work concurrently with QPS investigators throughout the course of the inquiry.

22. Extensive documentary evidence was also sought from Ardent Leisure, as well as other external parties, by way of numerous coronial directions. As a result, voluminous records pertaining to a myriad of issues, including the TRRR, modifications made, training, maintenance, job descriptions, operations at Dreamworld, certifications, workplace health and safety related issues, meeting minutes, safety decisions, policies and procedures, directions and complaints, were obtained.

23. Ultimately, comprehensive coronial reports with extensive annexures, including statements, interviews and documentary exhibits, were furnished by Detective Sergeant Nicola Brown, Gold Coast Criminal Investigation Branch and Senior Constable Steven Cornish, Forensic Crash Unit (FCU), Coomera.

24. As Coroner I attended the scene of the tragedy and was briefed by officers approximately two hours after the event and before the forensic pathologists attended. I also attended the day of testing and reconstruction, in company with my Counsel Assisting, Ms. Rhiannon Helsen and my Investigations Officer, Mr. Mark Ozolins.

POST MORTEM FINDINGS

Kate Goodchild

25. An external and full internal post-mortem examination was carried out on 26 October 2016 by Pathologist, Dr Dianne Little. A CT scan and toxicological testing was also conducted.[7]

26. The post-mortem examination revealed the presence of severe chest and abdominal injuries. A band of abrasions and bruising were found across the upper and mid trunk, as well as the corresponding area across the left upper arm. Internal injuries found included multiple rib fractures, fragmentation of the liver, transection of the duodenum and torn blood vessels to the right kidney. These injuries were the direct cause of death and suggestive of a crushing blow to this area of the body. There was no evidence of drowning.

Luke Dorsett

27. An external and full internal post-mortem examination was carried out on 26 October 2016 by Pathologist, A/Professor Alex Olumbe. A CT scan and toxicological testing was also conducted.[8]

28. The external examination revealed extensive bruising and abrasions over the entire body. Multiple severe contusions and crushing injuries to the neck, spine and ribs, as well as the liver, were found following the internal examination. These injuries were consistent with having been caused by multiple compressive impacts, particularly to the cervical area, and upper section of the thoracic spinal column, resulting in severing of the brain stem, as well as other injuries. Death would have been rapid. There was no evidence of drowning.

Cindy Low

29. An external and full internal post-mortem examination was carried out on 25 October 2016 by Pathologist, Dr Dianne Little. A CT scan and toxicological testing was also conducted.[9]

30. Extensive multiple injuries were observed to the head, chest, abdomen, pelvis and limbs, the combined effect of which was found to be the cause of death.

Roozbeh Araghi

31. An external and full internal post-mortem examination was carried out on 25 October 2016 by Pathologist, A/Professor Alex Olumbe. A CT scan and toxicological testing was also conducted.[10]

32. The cause of death was extensive disruptive chest injuries evidence of which was evident internally and externally. The mechanism of death was found to be a single disruptive compressive impact to the middle section of the chest due to a rapid movement by an implement. Death would have been rapid. There was no evidence of drowning.

[7] Ex A3 & A4
[8] Ex A7 & A8
[9] Ex A11 & A12
[10] Ex A15 & A16

DREAMWORLD STRUCTURE & OVERVIEW

33. The Dreamworld Theme Park is located on the Gold Coast at 1 Dreamworld Parkway, Coomera. It was developed by John Longhurst and was officially opened to patrons on 15 December 1981. Over the years, Dreamworld has expanded, and is now Australia's largest Theme Park comprised of various themed rides, wildlife and television branded attractions. Ardent Leisure Group, an Australian based leisure company, currently owns and operates Dreamworld, having acquired the park in 1998 from the Macquarie Leisure Trust.[11] Ardent Leisure operates Dreamworld along with the adjacent Whitewater World, Skypoint, AMF Bowling, Kingpin Bowling, and Good Life Health Clubs throughout Australia, New Zealand and the United States of America.[12] Ardent Leisure Limited was incorporated on 28 April 2003 and took over the ownership, management and responsibility of the Dreamworld assets from that date. The TRRR had long been in operation at that time. The documentation Ardent inherited in 2003 could well be described as "scant". They commenced their own record keeping from that date.

34. Within Dreamworld, under the command of the Chief Executive Officer (CEO), are the following Departments:[13]

- Operations;
- Engineering and Technical (E&T);
- Life Sciences;
- Retail;
- Sales and Marketing;
- Food and Beverage;
- Safety;
- Finance and Administration; and
- Employee relations.

35. The CEO of Dreamworld, at the time of the tragic incident, was Mr. Craig Davidson. All General Managers of the above Departments, and the Chief Financial Officer reported directly to him.[14] He held the ultimate decision making authority for Dreamworld, and liaised directly with the Ardent Leisure Board as to all relevant matters, including safety, expenditure and the like.[15] In a responsibility statement for the CEO, which was signed by Mr. Davidson on 20 March 2015, it notes, inter alia, that the position is responsible for the health and safety in all areas of their control and is responsible to:[16]

[11] Ex B1, pg. 9
[12] Ex B1
[13] Ex B12(26)
[14] Ex C8(10), pg. 11
[15] Ex C8(10), pg. 11
[16] Ex C7(580)

- Assist the business to develop and implement the Work Health and Safety Plan and actively support the Plan to meet the safety objectives;

- Ensure that managers under their delegation are aware of the work health and safety responsibilities;

- Ensure that relevant personnel perform risk assessments and implement controls in accordance with an relevant Regulations, Australian Standards and Codes of Practice;

- Establish an annual review of the Safety Management System to ensure it reflects the current legislation and supports the needs of the company;

- Regularly assess (at least every year), via internal auditing, how effectively operations comply with the required health and safety standards; and

- Participate in and support safety inspections – shall conduct at least one safety inspection of the Business per year.

36. The Operations Department, which is one of the largest within the Park, has a number of subsets, including Aquatics, Attractions, Entertainment, Costume, Security, Guest Services, Reception, Cleaning and Gardening.[17] The Operations Department is responsible for the '*smooth running of the park throughout the day*' and encompasses the Ride Operators, supervisors, relief supervisors and instructors.[18] At the time of the tragic incident, Mr. Troy Margetts was the Operations Manager at Dreamworld. He had held this role since 2014, having commenced employment with Dreamworld in 1990.[19] He was required to report directly to Mr. Davidson.

37. Mr. Andrew Fyfe was the Attractions and Entertainment Manager at Dreamworld, which was a subset of the Operations Department. He reported to the Operations Manager, having held this position for the past 10 years.[20] Mr. Fyfe was responsible for the daily operations of White Water World slide attendants, Dreamworld Ride Operators and the Attractions Supervisory team, as well as the entertainment staff and Laundry and uniform operations.[21]

38. Within the Operations Department, Ms. Nichola Horton was the Operations Systems Administrator, having worked at Dreamworld in various roles since 2002.[22] This role, which commenced in 2016, reported directly to Mr. Margetts, and was responsible for examining systems in place across operations through audits to determine what improvements could be made.[23] As part of this role, Ms. Horton was involved in amending and writing Ride Operator procedures for various rides within Dreamworld and ensuring these were placed onto Liferay, a new electronic document library.[24] She also had carriage of accounts for Operations, which included ordering for the Operations Department.[25] Ms.

[17] Ex B12(26), pg. 5
[18] Ex B12(26), pg. 5
[19] Ex B3C(50), pg. 6 & 7
[20] Ex B3A(17), [7]; Ex C8(6), pg. 5
[21] Ex B3A(17), [8]; Ex C8(6), pg. 5
[22] T25-4, lines 40-47
[23] Ex B3C(25), [2]; Ex C7(24)
[24] T25-8, lines 17-40
[25] Ex B3C(25), [2]

Horton also performed the role of Duty Manager at Dreamworld, which involved responding to guest complaints, any ride related emergencies, or any major events.

39. At the time of the incident, the Attractions Supervisors, who reported to Mr. Fyfe, included Ms. Jennie Knight, Mr. Jason Johns, Ms. Tracey McGraw and Ms. Sarah Cotter.[26] The responsibilities of the Supervisors were to '*ensure the safe and efficient daily operations of the Attractions Department through effective management of people resources and operational efficiencies…'* which included supervising the activities of attractions staff on a daily basis, attendance at daily operational calls, Code 6's and breakdowns on rides.[27] A Code 6 is the code used when a ride has ceased operation due to a technical fault. Each of the Supervisors had been Ride Operators previously and progressed to the position of Supervisor.

40. Relief Supervisors within the Attractions and Entertainment Department are responsible for supervising park operations, which includes supervising the Operators out on the rides, being called out to breakdowns, being out in the park to ensure that the operation runs smoothly and assisting to manage guest issues.[28]

41. According to the Attractions and Aquatics Induction Handbook, Supervisors in the Operations Department were responsible for the day to day operation of the park, which included daily supervision of all team members, liaising with other Departments as necessary, attending emergency situations, hazard and incident reporting, assessing team member's performance and assisting with guest enquiries.[29] They were also expected to work with management and various team members to execute new ideas and initiatives.

42. Meetings were held weekly with Mr. Margetts, Mr. Fyfe and the Supervisors within the Operations Department. Financial results were discussed, as were any relevant findings from recent Executive Meetings, with Managers providing an update as to any issues associated with their area.[30] Whilst ride down times and safety were not generally discussed during these meetings, any prolonged delay, unscheduled maintenance or ride shutdowns were canvassed.[31]

43. The Engineering and Technical (E&T) Department within Dreamworld is '*responsible for the servicing and maintenance of all of our rides and attractions'*[32] and is required to attend a ride in the event of a breakdown during daily operations. Personnel in this Department include multiple technical specialties, including electricians and mechanical fitters and turners. At the time of the incident, Mr. Christopher Deaves was the General Manager of Engineering. Whilst he had no tertiary engineering qualifications, he held an Advanced Diploma in Mechanical Engineering, as well as a Diploma of Business, Health and Safety and trade qualifications.[33] Mr. Scott Ritchie (Electrical), Mr. Mark Watkins and Mr. Wayne Cox were all Supervisors within the Department.

[26] Ex B3A(11), [2]; Ex C8(6), pg. 5
[27] Ex C7(19), pg. 1 & 2; Ex C8(6), pg. 6
[28] Ex C6(46), [13]
[29] Ex B12(26), pg. 7
[30] Ex B3C(50), pg. 19
[31] Ex B3C(50), pg. 19 & 20
[32] Ex B12(26), pg. 5; T5-19
[33] Ex B3C(46), pg. 5 & 6

44. Long-term former employee, Mr. Bob Tan, who resigned from Dreamworld in January 2016, commenced working at the Park in 1987 as the Assistant Maintenance Controller. He subsequently performed a number of roles, including the Projects Manager (1992), Technical and Services Director (1995), Maintenance Controller (2003), General Manager of Engineering (2009), before taking on the role of Director of Special Projects within the Engineering Department (2014) when Mr. Deaves was promoted to the General Manager of Engineering.[34] Mr. Tan reported directly to the CEO. During his tenure at Dreamworld, he became a qualified engineer, however, was not RPEQ certified.

45. At the time of the incident, the Safety Department at Dreamworld was responsible for assisting with safety compliance at the Park, and to continually improve culture/business practice in conjunction with other Departments.[35] Mr. Mark Thompson was the Safety Manager at the time having commenced in the position in March 2016.[36] He was responsible for delivering training on general safety matters at induction, park-wide safety matters, responding to issues raised through the incident system and implementing control measures for these hazards and investigating suspected safety breaches, as well as oversight of the First Aid Clinic.[37] Mr. Thompson reported to Mr. Angus Hutchings, who was the Group Safety Manager for Ardent Leisure.[38] Mr. Hutchings had held this position since 2010, and was responsible for providing advisory services with respect to safety and strategic planning to all of the Ardent Leisure business groups, including Dreamworld.[39] From 2004 until 2010, Mr. Hutchings held the position of Dreamworld Safety Manager.[40] In both roles, he was required to report to the CEO. Mr. Hutchings had prior experience working for the Safety Regulator, OIR, however, had not previously been involved in implementing or devising safety systems.[41]

46. Within Dreamworld there were also a number of subset groups and teams, which met at various intervals to discuss different matters. From the records provided, the most pertinent groups relevant to the decision making within the Park seem to be as follows:

    (i) The Leadership Team, which consisted of General Managers of the various Departments within the Park, including Mr. Margetts, Mr. Thompson, Mr. Tan and Mr. Deaves.[42] A wide range of issues were discussed during these meetings, including safety, financials, guest service issues, rides and upcoming events.[43] The CEO would sometimes attend these meetings if needed.

    (ii) The Executive Safety Committee consisted of the CEO and General Managers of the Departments, which at the time of the incident relevantly seems to have included Mr. Craig Davidson, Mr. Deaves, Mr. Hutchings and Mr. Margetts.[44] Topics discussed at these meetings included ride

[34] Ex B3C(54), pg. 20; Ex F12(540)
[35] Ex C6(51), [40]
[36] Ex C6(51), [3]
[37] Ex C6(51), [3]
[38] Ex C6(51), [7] & [8]
[39] Ex C8(10), pg. 5 & 6
[40] Ex C8(10), pg. 8
[41] T21-28 & 29
[42] Ex C8(6), pg. 19; Ex C8(10), pg. 14-17
[43] Ex C8(10), pg. 18
[44] Ex C8(6), pg. 19; Ex C6(51), [33]; Ex C8(4), pg. 9

modifications.[45]

(iii) The Engineering Management Team, which consisted of the General Manager of Engineering and Supervisors, as well as Mr. Thompson, as the Safety Manager. Weekly meetings were conducted,[46] with issues associated with rides, including down-times, being discussed.[47]

47. Further specific details as to the Safety and E&T Departments at Dreamworld and their respective responsibilities and staffing, commence at page 78.

THUNDER RIVER RAPIDS RIDE (TRRR)

48. The TRRR commenced operation in December 1986, as part of the rustically themed Gold Rush Country section of the Theme Park. It was manufactured in-house at Dreamworld between 1985 and 1986, and was based upon a 1979 Intamin Amusement Ride called 'Rapids Ride'.[48] Information as to the original construction and subsequent modifications to the TRRR, as provided by Ardent Leisure and OIR, are minimal. A summary of the information provided as to the various modifications and alterations made to the ride over its 30 year commission, are outlined further below commencing at page 25.

49. The TRRR was designed by consultant engineers. Mr. Len Shaw, the Engineering Services Manager for Dreamworld, oversaw the construction. The engineering drawings were provided at the time to Workplace Health and Safety (as it then was) and approved by the Chief Inspector of Machinery for the Division of Occupational Safety.

50. On 14 August 1987, the design of the TRRR was approved by the Chief Inspector of Machinery in principle, subject to safety devices and guarding being found to be to the requisite satisfaction of the District Inspector of Machinery.[49] Supporting documentation to the design approval indicates that the ride was certified at that time by a Consulting Engineer attesting to the safe structural integrity of the design, and that it was compliant with the Australian Standards.[50]

51. The TRRR was designed as a family orientated, aquatic based amusement ride, which consisted of a raft that seated six occupants. Riders entered a long partially indoor queue with a number of switchbacks, along with an express line for the Ride Express pass holders. Upon reaching the front of the queue, riders were guided onto a circular raft by one of two TRRR Ride Operators, before being dispatched from the loading area. The ride then proceeded to be propelled by a natural flow of water through the man-made river's watercourse, which includes calm and turbulent rapids, with rafts reaching speeds of up to 45 kph.[51]

52. The raft travelled a watercourse (rapids) through various troughs and tunnels, which was approximately 450 m long.[52] A wooden conveyor transported the rafts at the end of the ride to the unload area. The duration of the ride, until the commencement of the conveyor, was approximately three minutes and 16

[45] Ex C5(51), [36]
[46] Ex C6(51), [30]; Ex B3C(53), pg. 11
[47] Ex B3C(53), pg. 11 & 12
[48] Ex B1, pg. 10
[49] Ex F9C(3)(a), [9]; Ex F9C(3)(b), pg. 1
[50] Ex F9C(3)(b), pg. 3
[51] Ex B1, pg. 10
[52] Ex F9A(1), pg. 3

seconds[53] with a 35 second delay between each raft. It took approximately 42 seconds for a raft to travel on the conveyor and arrive at the unloading area.[54] The approximate total ride time for the TRRR was 4 minutes and 10 seconds.[55]

53. Riders could get wet during the course of the ride, which ended when the raft was elevated and transported by a conveyor towards the unloading area, which is adjacent to where patrons are loaded onto the ride.

54. Below is an aerial view of the ride, with the path travelled by each raft through the watercourse highlighted in yellow.

FIGURE: Ex F9A(1), pg. 4

Configuration of the TRRR

Forensic Crash Unit Investigation

55. As part of the QPS investigation, the mechanical and technical aspects of the TRRR, its operation and the tragic incident were analysed by Senior Constable Steven Cornish from the FCU at Coomera. This analysis included detailed consideration of the technical operation of the ride and its components in their entirety, relevant supporting documentation as to the ride and its history, as well as the mechanism and timeline of the incident. Extensive on-site testing of each component of the ride was carried out, in addition to various attempts to reconstruct the tragic incident.

56. Senior Constable Cornish's findings were detailed in a supporting coronial report, with the various testing and other diagrams and exhibits annexed.[56]

57. The findings reached by Senior Constable Cornish were accepted and reinforced by expert evidence provided by way of a conclave during the inquest hearing, and have formed the basis for the details as to the configuration of the TRRR, the timeline of the incident, and the cause.

[53] Ex B2, pg. 6
[54] Ex B2, pg. 6
[55] Ex B1, pg. 10
[56] Ex B2

Configuration of the TRRR at the Time of the Incident

58. There were a number of major components of the TRRR, which whilst operating individually, also played an integral and interdependent role within the overall successful function of the ride.[57] The central components of the ride consisted of a trough, water pumps, conveyor system, rafts, pneumatic gates, operating control system and raft support rails.

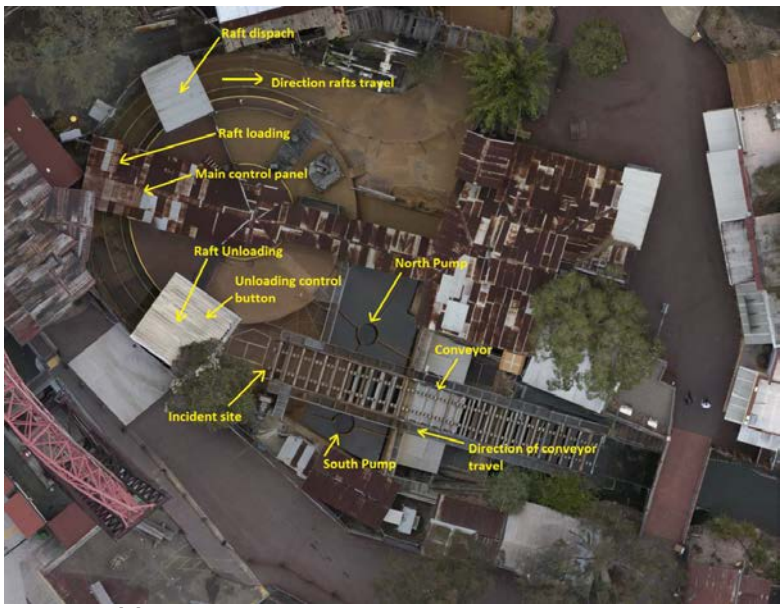


FIGURE EX. F9A(1), PG. 7: OVERVIEW OF TRRR WITH LOCATION OF LOADING & UNLOADING AREA, PUMPS, CONVEYOR & RAILS

Operating Control System

59. The main operating control panel was located at the designated loading area of the ride.[58] It had the capability of operating all of the independent components of the ride, and was the only panel to have this access. The CCTV from five cameras located around the ride were displayed on a monitor within a partitioned wooden area. The position of this panel allowed the Ride Operator to oversee the trough area as the rafts departed, as well as the conveyor system and unload area.

MAIN CONTROL PANEL AS IT APPEARED OCT 2016 - EX B2, PG. 30

[57] Ex B2, pg. 6
[58] Ex B2, pg. 8

60. There is an approximate distance of 12 metres between the Main Ride Operator and the Unload Operator.[59] Due to the distance from the conveyor and unload area, as well as the wooden structure of the control unit and exit walkway fencing, the line of sight of the end of the conveyor by the Ride Operator stationed at this panel was somewhat obstructed.[60] There was no electronic communication between the two Operators.

Trough

61. The trough was the channeling system, which the water flows through over a distance of 410 metres, transporting the rafts and occupants.[61] It was generally constructed of concrete with a depth of 1.3 metres and a width measuring between three to five metres around the course of the ride.[62]

62. Along the length of the trough, there were a series of turns, barriers and floor mounted wooden logs. These elements were designed to create a turbulent flow for the water, and to simulate a rafting experience. There were also a number of tunnels, one of which had animations and attractions related to the ride and operated by motion sensors.[63]

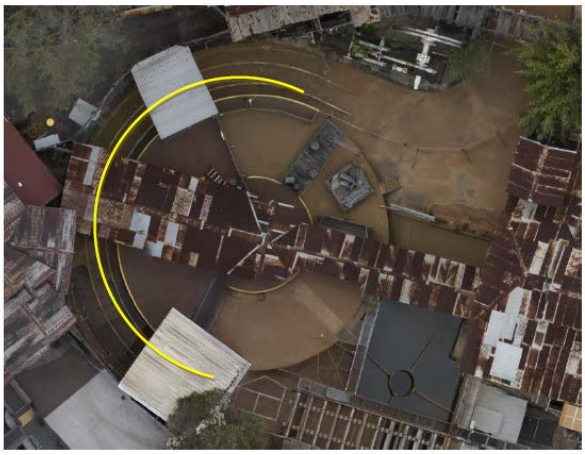
63. Through the load and unload area of the ride there were outer metal guide rails and wooden barge planks on the trough, which were designed to assist with the loading and unloading of guests from the rafts.[64]

Raft Supporting Rails

64. Mounted throughout the trough system in the load and unload areas of the ride were steel raft support rails, which were primarily intended to prevent the rafts from heeling (tipping) or flipping whilst occupants were embarking or disembarking.[65] The rails also prevented the rafts from dropping to the bottom of the trough in the event that the water level reduced or completely dissipated.

65. The steel railings were a dual system constructed of 100 mm wide right angle steel, spaced 1450 mm apart (outer to outer) and bolted to the concrete floor of the trough.[66] Within the level area of the trough between the load and unload areas, the railings were positioned a minimum of 700mm above ground level and remained level for the complete length of the construction.[67]

[59] Ex B2, pg. 65
[60] Ex B2, pg. 9 & 65
[61] Ex B2, pg. 11
[62] Ex B2, pg. 11
[63] Ex B2, pg. 11
[64] Ex B2, pg. 11
[65] Ex B2, pg. 12
[66] Ex B2, pg. 13
[67] Ex B2, pg. 13



DEPICTS THE RAILING SYSTEM THROUGH ENTRY/EXIT AREA - EX B2, PG. 12

66. Additionally, there were a series of support railings in the trough prior to the beginning of the conveyor (bottom), which were installed in 2015.[68]

67. In the area of the incident at the end of the conveyor (top), there was no variation in the level, with the support rails having been adapted to suit the sloping nature of the flooring leading back to the area beneath the conveyor, known as the 'pit'.[69] This area is where the water for the ride was gravity drained back into the storage reservoir.

EX B2, PG. 14

Conveyor System

68. The conveyor on the TRRR was a mechanical device, which was chain driven by an electric motor. The conveyor belt was constructed of a series of wooden planks of two variations in size and evenly spaced along the belt.[70] The conveyor was located towards the end of the ride, and was used to carry rafts from the end of the trough system up to the unloading area.

69. The drive axle and two cogs were fixed to the western end of the conveyor where the electric motor was attached. There was a dual chain system, which the

[68] Ex B2, pg. 13
[69] Ex B2, pg. 14
[70] Ex B2. Pg. 16

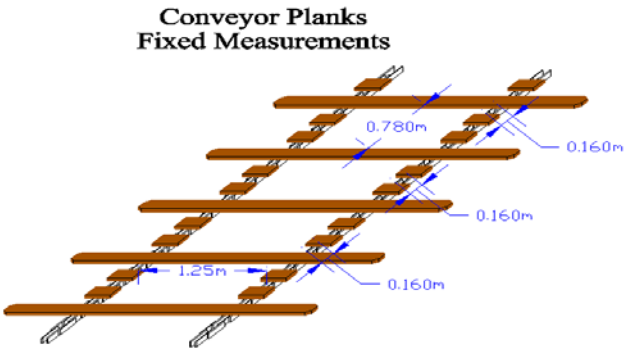
planks were attached to, that was pulled along from the drive axle.[71] The conveyor was driven by its own dedicated, power source and control system, which was not linked to any other of the ride's components.

70. The main control system for the conveyor was located at the Main Control Panel, with a further control box, primarily used for maintenance purposes, located next to the conveyor away from public access.[72] At the Operator control panel, there was a start and stop button, as well as a reset button, which could be used to restart the conveyor in the event that it was stopped under the Emergency Stop procedures.[73] Upon depressing the start button, it became illuminated to show it was operating whilst the red button flashed. The red button initiates the slow shut down of the conveyor. There was no Emergency stop for the conveyor available at the Main Control Panel.[74]

71. During testing of the conveyor and Main Control Panel, Investigators found that depressing the stop button for the conveyor was sufficient to initiate a slow stop.[75] A slow stop of the conveyor took 8 seconds for the conveyor to come to a complete stop.[76] Activation of the E-Stops were found to stop the conveyor in two seconds.[77]

72. Given the location of the incident and mechanism involved, extensive examination of the conveyor was undertaken by Senior Constable Cornish and other officers, which included intricate manual measurements.[78] Video recordings of the conveyor's movements also assisted to calculate speeds, as well as the interaction with the rafts, supporting railings and water flow.[79]

73. The measurements of the conveyor planks, including the spacing and configuration, are as follows:[80]



74. The speed of the conveyor was found to be 2.7 kph.[81]

75. An open air gap was found between the end of the conveyor closest to the unload station and the beginning of the raft supporting rails. This interface area, which was significant during the incident as it was into this gap that Raft 5 was pulled down once inverted, was extensively examined and measured. The gap of the

[71] Ex B2. Pg. 16
[72] Ex B2. Pg. 16
[73] Ex B2, pg. 37
[74] Ex B2, pg. 37
[75] Ex B2, pg. 37
[76] Ex B2, pg. 54; T2-43 & 44
[77] Ex B2, pg. 82
[78] Ex B2. Pg. 16
[79] Ex B2. Pg. 16
[80] Ex B2. Pg. 17
[81] Ex B2, pg. 20

interface between the conveyor's long planks at their furthest point, and the leading edge of the support rail was found to be 430 mm, with a 760 mm gap between the leading edge of the support rails and the drive axle (when exposed).[82]

DEPICTS SIDE PROFILE OF INTERFACE, Ex. B2, pg. 21

76. Further details as to the modifications made to the conveyor over the duration of the ride's 30 year commission commence at page 25**.**

Water Pumps

77. There were two Danfoss VLT Aqua VLT 8502 Drives, which operated the two induction motors (water pumps) utilised by the ride.[83] The drives were installed in 2006.[84] The pumps were referred to as the North and South pumps due to their positioning. The pumps were located under the conveyor belt, in a separate confined enclosure.

78. The controls for both the pumps (stop and start) were located at the Main Control Panel by way of separate buttons. A display on the panel also showed the amps for the respective pumps. This was a predetermined figure, which took into account the condition of the pump and the operating hertz of the motor in the main electrical room.[85] For the TRRR pumps, the reading was to be below 500 amp, and was generally between 430-460 amps.[86] The control panel had no mechanism to allow for a variation of the power of the pump, which would subsequently vary the water flow. The variation in the amp usage was determined by the water level in the reservoir. The lower the water level, the higher the amp output to maintain the constant flow through the outlet.[87]

79. The amp display, red and green lights, were the only visible aspect on the panel, which showed that the pump was functioning.[88] Each pump functioned independently of the other, and could be started and stopped separately.[89] An emergency stop at the panel also deactivated the North pump only.[90] There was

[82] Ex B2, pg. 20
[83] Ex B2, pg. 23; Ex G2, [24]
[84] Ex G2
[85] Ex B2, pg. 35
[86] Ex B2, pg. 36
[87] Ex B2, pg. 35
[88] Ex B2, pg. 35
[89] Ex B2, pg. 23
[90] Ex B2, pg. 35

no emergency stop for the South pump, or one that stopped both pumps simultaneously.[91]

80. The North and South pumps were gravity fed from the storage reservoir, before being pumped out through the two outlets positioned under the conveyor belt. The pumps had the ability to pump ***up to 4000 litres per second***.[92] This large water flow created the initial current around the load and unload areas, before it naturally flowed down through the trough system around the ride. The two outlets were 1.6m in diameter and approximately 3 metres from the bottom of the pit.[93] They were also utilised in a reverse flow manner when water was being drained from the ride area, which caused the water level to drop quickly and considerably.[94]

81. Under the instruction of Electrical General Manager, Scott Ritchie, Senior Constable Cornish was shown the start-up procedures for the pumps. It was observed that the North pump was activated first, and took approximately 7 minutes to get to operating capacity and its full ampere.[95] Once this was achieved, the South pump was then activated and the same process followed. Once the amp reading had stabilised and the pumps' respective green lights were at a solid illumination, the pumps were deemed to be operating at full capacity. A final visual check was then to be undertaken by the Ride Operator of the water level in the trough.[96] The same process could then be utilised to manually shut down the pumps, pressing the red button to stop each pump.[97] A key start and shut down process is stipulated in the Operators Procedure Manual, which involves the use of a key start, which commences the auto sequence.[98]

PUMP OUTLETS IN PIT, EX. B2, PG. 15

Rafts

82. The rafts consisted of a fibreglass constructed tub, inserted into a large custom built rubber tube, known as a floatation collar. The floatation collar was internally separated into eight air chambers, which could hold a maximum of 2 PSI.[99] Each

[91] Ex B2, pg. 35
[92] Ex B2, pg. 24
[93] Ex B2, pg. 86
[94] Ex B2, pg. 86
[95] Ex B2, pg. 36
[96] Ex B2, pg. 36
[97] Ex B2, pg. 36
[98] Ex B2, pg. 36
[99] Ex B2, pg. 25

raft had six allocated seats. They were inspected on a daily basis by E&T staff, and often drained each morning as they would take on water during the day.

83. Neither the intended lifespan of the rafts or floatation collars in use at the time of the incident nor how long they had in fact been in use by this date is known.

84. It should be noted that Raft 6, which was the stationary raft involved in the tragic incident, had various notes recorded in recent daily checklists (6, 11, 15 & 20 October) with respect to air pressure in the floatation collar.[100]

85. On 31 October 2016, all rafts in service on the TRRR were weighed. It was found by Senior Constable Cornish that there was a variation of up to 100kgs between all of the rafts.[101] Possible reasons offered for this variation were the rafts being unable to be completely drained due to blockages in internal construction, an amount of water soaking into the fibreglass, ropes or other materials within the raft, or water within the collar.[102]

Pneumatic Gates

86. A series of pneumatic gates, referred to as 'jacks' were positioned within the loading and unloading zones. There were a series of two jacks at each of the load and unloading areas. The primary function of the jacks was to restrict the flow of the rafts through the trough system.[103]When operated, the jack protruded into the canal stopping the raft from traveling further forward.

87. The primary operating system for the jacks was located at the main operating panel. At the loading area, the jacks were used to hold the raft in place to allow patrons safe access. There was a timing alarm integrated into the dispatch jack's release, which was designed to ensure that there was a safe gap between each of the rafts leaving the area and commencing the water course. The timing was approximately 35 seconds.[104] The Ride Operator at the Main Control Panel was able to control the loading and dispatch jacks, as well as the final unload jack.

88. On the Main Control Panel, the load button operated the two jacks at the loading area. Depressing the button caused both gates to open, moving the loaded raft to the dispatch jack, whilst an empty raft moved forward to be loaded with further patrons. Once the time delay alarm had sounded, the Ride Operator could depress the load 2 button on the control panel, which then released the raft onto the water course. The load and load 2 buttons were operated completely independently of each other.[105]

[100] Ex B2, pg. 27
[101] Ex B2, pg. 28
[102] Ex B2, pg. 28
[103] Ex B2, pg. 29
[104] Ex B2, pg. 29
[105] Ex B2, pg. 30

DEPICTS LOADING JACKS, Ex. B2, pg. 30

89. Within the unload area, there were two jacks with operating buttons on poles. The first was used to stop and secure the rafts, which allowed the patrons to disembark safely. The second jack was closer to the conveyor, and was designed to prevent any approaching rafts from colliding with the stationary raft in the unload area.[106] The jack near the conveyor was installed in 2004, following an incident where an approaching raft collided with another in the unload area, causing a patron to fall into the watercourse.[107]

90. Further details as to the modifications made to the ride over its 30 year commission and previous incidents are detailed below.

Safety Features of the TRRR

Emergency Stops (E-Stops)

91. There are a series of Emergency Stops, 'E-Stops', that were installed to activate a near instantaneous stop of the conveyor.[108] They were located at the unload area, the conveyor control panel box, and a lanyard emergency stop, which was positioned either side of the conveyor.

92. The E-stop at the unload area was the only mechanism, which could stop the conveyor, that was accessible by an employee or member of the public. It was housed in a yellow box with a red button in the centre.

Ex. B4 (5), pg. 25

[106] Ex B2, pg. 31
[107] Ex B2, pg. 31
[108] Ex B2, pg. 38

93. Testing by Investigators confirmed that there was not a single control button which would initiate a complete shutdown of all of the ride's mechanism.[109]

Raft Safety Stop

94. Infra-red switches were positioned at the beginning of the conveyor (bottom), which identified when a raft was stationary at that point for a period of at least 15 seconds. If this occurred, an audible alarm sounded, the conveyor stopped and the release jacks were closed to prevent further rafts from entering the trough system.[110]

95. Further details as to these upgrades to the conveyor, which took place in 2016, are set out below.

Chain Break Safety

96. A second series of sensors were located at the beginning of the conveyor, which were designed to monitor the conveyor chain cadence at a certain rate. If the sensor was not tripped for a period of five seconds there, it triggered a shutdown of the conveyor as it assumed that there was a break in the chain.[111]

Anti-Roll Back Gates

97. A set of four small gates were mounted to the incline component of the conveyor, and were designed to stop rafts from sliding backwards along the conveyor planks whilst traveling up the conveyor.[112]

Water levels

98. Ride Operators were required to monitor water levels within the trough of the ride. There was no formal water marker present in the trough of the load and unload area.[113] Rather, Operators were required to measure the water level by reference to a scum mark on the wall of the trough, which was made from years of the ride operating.[114]

History & Modifications to the TRRR Since 1986

99. The TRRR opened on 11 December 1986, and at the time of the incident, had been operating for almost 30 years. During the course of its commission, the Ride had undergone a number of modifications to various components, although largely operated as it was intended to when first opened. A number of the major components of the ride were original, with only slight improvements or modifications having been made.

100. Documentation provided by Ardent Leisure relating to the history of the TRRR, including the modifications made and any associated issues, which arose on the ride, are scant at best. There is limited information as to the reasons for some of the alterations, when they were carried out, and if any formal type of risk or

[109] Ex B2, pg. 83
[110] Ex B2, pg. 39
[111] Ex B2, pg. 40
[112] Ex B2, pg. 41
[113] Ex B2, pg. 74
[114] Ex C7(18)(a), pg. 27

hazard assessment was undertaken prior to or following the modifications being made.

101. In more recent times, records suggest that ride modifications were discussed at a number of different management meetings, including the Executive Safety Committee Meetings, however, it seems proposals may have been verbally discussed with the CEO, with capital expenditure approvals submitted through a more formal process.[115]

102. Overall, from the documentation provided, it appears that the modifications made to the TRRR include:

- Removal of the conveyor slats (1989-1990 est.);[116]
- Removal of the turntable (1990-1991 est.);[117]
- Changes to the Operator Controls (1991-2016);[118]
- Pump discharge pipes repositioned (1999-2000 est.);[119]
- Pump motors replacement (2012);[120]
- Mesh and rails at conveyor foot (2016);[121]
- Pump motor drives replacement (unknown);
- Rails at conveyor head (unknown); and
- Removal of the rubber patches of the raft plug bases (unknown).

103. Below is a summary of some of the relevant modifications made to the TRRR based on the limited records available.

Issues with the Conveyor and Removal of Slats

104. At the time of the tragic incident, it was evident that at some point in the history of the ride, every 2nd and 3rd conveyor slat had been removed. Whilst it is not clear when this modification was carried out, records suggest the following timeline:

(I) *25 January 1988*[122] *– Rapid Ride Tail Shaft Failure*

At 1:50 pm on 6 January 1988, the tail end of the TRRR conveyor started to tear the timber slats off the conveyor chain.[123] An inspection found that the tail shaft had fractured at a point in line with a locating bush on the northern side of the idler sprocket. The break was clean and '*unquestionably due to fatigue'* with similar damage found on the other side of the sprocket. It was thought that this was due to a design fault. This break caused the conveyor to destroy itself at the tail end on the supporting steel, smashing 25 timber slats and badly distorting both chain sections, tearing chain attachments off the links and completely destroying bearing seals.[124]

[115] Ex B3C(54), pg. 10
[116] Ex B12(16); Ex B4(1), 40
[117] Ex C4(5), pg. 858-860
[118] Ex B12(1)
[119] Ex C4(5), pg. 444-445
[120] Ex C4(5), pg. 444-449
[121] Ex C4(5), pg. 447-449
[122] Ex C9(165) – it appears that the reference to 1987 is an error, as 1988 is referred to throughout the memorandum
[123] Ex C9(165)
[124] Ex C9(165)

It was noted that it was fortunate that a raft was not on the conveyor at the time of the incident.

Repairs required to be carried out included the fitting of a new shaft, new seals and new timber slats. The chain was able to be repaired.

(II) *16 January 1989 – Rapid Ride (timber slat removal suggestion)*

In a memorandum directed to Mr. Garth Bell from Mr. Len Shaw, Engineering Services Manager, it was reported that on 15 January 1989, damage occurred to 3 slats on the TRRR conveyor.[125] This seems to have been a recurring issue. On this occasion, it was surmised that the issue may have been happening at the head of the conveyor due to water flow from the southern pump, which was lifting the return side at an angle sufficient for a slat to drop off the return guide track.[126] It was thought that the slat would then run under the track until it reached the pump house wall before it jammed and then broke as it tried to pass underneath.

It was suggested at this time that every alternate timber slat should be removed in order to achieve the following:

- Reduce the overall weight of the system.
- Reduce the floatation effect of the timber.
- Reduce the number of things which can 'get caught'.

It was suggested that a trial period of a section of the conveyor should be conducted to ensure other issues weren't created by this modification.

It was noted that something had to be done as '*this chain is the subject of continuous repair section by section. The working environment for a steel chain is the worst possible imaginable.*'

Mr. Shaw noted that *'there is no way I can guarantee a trouble free run on the ride when there is no control by us as to what the water does'.*

105. According to Mr. Bob Wood, who commenced working at Dreamworld in November 1988 as a mechanical fitter, the TRRR initially had full length planks on the conveyor.[127] He recalls that the weight of the conveyor was causing the conveyor chain to wear, which resulted in links having to be removed to shorten it.[128] He was aware that a decision was made to remove every second plank gradually from the conveyor to reduce the weight and the load being placed on the chain.[129] To the best of his recollection, Mr. Wood thought this may have taken place in the early 1990s.[130] The weight placed on the chain, however, continued to be a regular issue despite this modification.[131]

[125] Ex B12(16)
[126] Ex B12(16)
[127] Ex B17(3), [8]
[128] Ex B17(3), [8]
[129] Ex B17(3), [9]
[130] T28-12, lines 1-23
[131] Ex B17(3), [9]

106. The below photograph depicts the conveyor as it was initially constructed in 1985.[132]

107. Mr. Wood stated during the inquest that by the time he left employment with Dreamworld in 2012, every 2nd and 3rd slat had been removed from the conveyor.[133]

108. According to Mr. Tan, who was employed in various roles within the Engineering Department, including as the Manager since 1987, the removal of the wooden slats on the conveyor took place between 1988 and 1990 because it was frequently tripping.[134] The boards were removed to reduce the weight the conveyor motors were required to drive, and to improve the chain 'release' from the head sprocket.[135]

Turntable Removal

109. Originally, the TRRR had a timber turntable at the end of the conveyor near the unload area, which moved the rafts from the conveyor onto an arm of the turntable that would then move the raft to a stationary position at the unload area.[136] It was a large device, which spanned the end of the conveyor all the way around the load and unload areas, whilst an arm of the turntable would ramp off allowing the raft to float into the watercourse.[137] There were no steel supporting rails near the conveyor or unload area at the time it was in use.[138]

110. In a memorandum from Mr. Len Shaw, Engineering Services Manager, to Mr. Wes Hepburn titled, *Memorandum 13 August 1987 – Rapid Ride Turntable,* it was noted that there had been reoccurring issues associated with the turntable at the TRRR.[139] Since December 1987, the total cost of requisitioned material and services to maintain the whole of the ride operationally was $22,956.98, with over 1000 man hours needed. The turntable component of those costs was $5670, and about 300 man hours. The main issue seemed to be with the rolling wheels, which shed the tyre, bearings in the rolling and thrust wheel collapsing. To replace these failings was labour intensive and costly.

[132] Ex B17(1)(a), pg. 2, photograph 8
[133] T28-14, lines 17-25
[134] Ex B3C(54), pg. 6
[135] Ex B3C(54), pg. 6
[136] Ex B17(3), [13]
[137] Ex B17(3), [13]
[138] Ex B17(1), [12]
[139] Ex C9(167)

111. It was submitted that air operated jack stands should be installed in lieu of the turntable for the load and unload areas, with a controlled dispatch to pass rafts at timed intervals. It was estimated that the cost of this system would be $7000.

112. In a memorandum from Mr. Len Shaw to Mr. Garth Bell titled, ***Memorandum 20 February 1990 – Rapid Ride Turntable,*** improvements to the way rafts were loaded and unloaded at the TRRR were outlined.[140] By February 1990, the issues were said to be urgent with rectification work needing to be carried out as soon as possible. The support track for the turntable was reportedly disintegrating fast, with further wheels needed and the cost of labour and maintenance growing daily. The table was also unable to be driven properly when wet. Further, the ride was unable to be operated with less than two people, and in quiet times, the rafts had to be kept moving as there was nowhere to hold an empty raft. The maintenance cost of the current system was $25,000 per year.

113. An air operated holding and control system was costed to replace the current turntable system. This would allow the rafts to be home when the activity of the ride was zero. The cost of the modification was thought to be less than $5000. It was expected that the new system would be installed before the Easter Holidays.

114. Evidence from employees at the time suggests that Mr. John Angilley was involved in the removal of the turntable and the subsequent redesign of the load and unload areas.[141] Whilst it is not entirely clear when this significant change was undertaken, evidence suggests that it may have been in the 1990s.[142] According to Mr. Tan, the modification took place between 1988 and 1990, and was done as the drive was slipping during wet weather, the bearings were constantly failing due to its submerged operation, and the inadequate fixings of the guide tracks required frequent attention and repairs.[143]

115. Following the removal of the turntable, it appears that the support railings were installed in the trough near the unload area at the end of the conveyor.[144] It seems from the outset, the railings were bolted and welded to the trough, and were required to be checked every day as part of the daily inspections.[145] During the inquest, Mr. Angilley stated, to the best of his recollection, the steel support railings were initially placed as close as possible to the end of the conveyor limiting the gap, however, he was unable to recall the distance with any certainty.[146]

Pumps

116. In a memorandum from Mr. Len Shaw, Maintenance Manager, to Mr. Wes Hepburn dated 23 November 1987, titled, ***Memorandum 23 November 1987 – Rapid Ride Pumps,*** issues were raised with the 'imbalance of loading' on the TRRR pumps.[147] This seems to have been a recurring issue, at least since 18 November 1987, following which daily tests had been carried out to try and determine the cause.

[140] Ex C9(168)
[141] Ex B17(3), [11]
[142] Ex B17(3), [15]; T28-34 & 35
[143] Ex B3C(54), pg. 8
[144] T28-33, lines 5-30
[145] Ex B17(3), [15]
[146] T28-34, lines 25-40; T28-39, lines 20-40
[147] Ex C4(5), pg. 856

117. On 22 January, both pumps had to be stopped and started again in a short period of time. On the first occasion, the No. 2 pump shut down by electrical overload. This pump was able to restart a short time later. After a few minutes it was noted that the electrical load on the No. 1 pump was very heavy, and the pump was restarted. It was suspected that a 'whirlpool' at the suction point may be the cause of the issue, which could be rectified if modifications were made to the pump well.[148]

118. Further similar tests were to be conducted over the next few days with differing time lapses. If the findings supported the suspected cause, it was proposed that steps be taken to improve the installation, '*along with the proposal to modify the conveyor within the next few weeks*'.[149]

Operation Control Panel Modifications

119. From a memorandum directed to Mr. Bob Tan, Mr. Steve Romer and Mr. John Angilley from Mr. Greg Handley on 26 June 1998, titled, *Memorandum 26 June 1998 – Operator panel upgrade,* it seems that the main Operator controls at the TRRR were upgraded, and appeared as was found by Investigators at the time of the incident[150] This allowed the panel to be operated by way of a start key, with indicators and switches pertaining to the North and South Pump, motor current, conveyor, cave lights, air pressure and the automatic sequence of the ride.[151]

120. It was noted that the emergency stop was to be positioned separately to the main panel, but in close reach to the Operator.[152] The location was to be selected by Operations. The activation of the emergency stop would commence the following steps - (1) shut down the North Pump only, (2) Stop the conveyor, but allow the Operator to restart the conveyor at any time; and (3) Close the emergency gate.[153]

Raft Collar Quote

121. Documentation shows that in September 2015, a quote was sourced from Dynamic Attractions as to three new floatation collars with a modified lashing strap for the rafts at the TRRR.[154] Dynamic Attractions offer a wide range of engineering, design and building solutions for the amusement industry.[155]

122. In June 2016, a further quote was prepared by Dynamic Attractions for '*River Rapids Replacement Boats for Dreamworld'*.[156] This proposal states that Dreamworld had requested a quote for 12 replacement fibreglass boats for the TRRR. They were to be identical to those currently in use, so as to '*maintain the look of the fleet and allow Dreamworld to continue to use all of the same parts and attachments*'.[157] Per boat, it was estimated that the cost would be

[148] Ex C4(5), pg. 857
[149] Ex C4(5), pg. 857
[150] Ex B12(1)
[151] Ex B12(1), pg. 1 -3
[152] Ex B12(1), pg. 3
[153] Ex B12(1), pg. 3
[154] Ex B15(3)
[155] Ex B15(4), pg. 4
[156] Ex B15(4)
[157] Ex B15(4), pg. 3

$12,125.[158]

123. From the documentation provided and evidence given during the inquest, it is not clear as to the reason this quote was sourced, and why it was not actioned.

General Feasible Improvements

124. A document dated the 11 October 2004, titled, *'Thunder River Rapids Ride'*[159] shows clearly that the following feasible improvements to the ride were being considered at that time:

    1) Consider and analyse the impact if E-Stop is changed to **stop both pumps** instead of the current 1 pump.

    2) Install a **second E-Stop** switch at Unload area.

    3) Institute **timer permitted despatch** to both despatch stations.

    4) Fabricate and install an **additional 'Raft Hold' device** at location prior to the current unload location. Investigate:

        a. Alarm if second gate occupied
        b. Then followed by Conveyor Slow down
        c. Then followed by Pumps stopping

    5) Overhead Handrails with strap grips (similar to types for bus/train standing passengers)

    6) Design a device to **power rotate raft** at the current Unload station – rollers at far end, and a powered conveyor on platform side c/w self-homing feature.

125. It is not clear who authored this memorandum or the reason it was drafted. It is evident from the configuration and state of the ride at the time of the tragic incident that only some of the improvements were considered and had been implemented in the 12 years since.

Changes to the Unload Area

126. Photographs within other records held by Dreamworld demonstrate the difference following upgrades to the unload area of the TRRR.[160] A photograph dated 14 May 2005 suggests that a wooden platform used to jut from the unloading area back towards the conveyor. A further photograph dated 25 February 2006 shows a permanent concrete structure where the timber boards used to be utilised.[161]

Raft Track

127. In accordance with a Memorandum dated 25 January 1988 titled, *'Rapid Ride Loading Dock Raft Track*', on 12 January 1988, the load and unload dock raft

[158] Ex B15(4), pg. 6
[159] Ex B15(7)
[160] Ex B12(1), pg. 11-13
[161] Ex B12(1), pg. 13

control arm track fractured, which resulted in 10 metres of track being destroyed.[162]It was suspected that the support arm suffered a collapsed bearing. The track was rebuilt overnight and normal operations commenced on 13 January 1988. The faulty bearing and wheel were replaced.

Conveyor Chain Break and Raft Slip Monitoring

128. In August 2015, following a risk assessment conducted by the Safety Department in July 2015 (outlined further at page 76 onwards), a scope of work for the upgrades to the Conveyor Chain Break and Raft Slip were prepared.[163] These upgrades were intended to take place at the bottom of the conveyor (beginning of the incline). It does not appear that Mr. Deaves or any member of the E&T Department were directly involved in the risk assessment conducted, although some consultation on-site did take place following the process.[164] It does not appear that discussions as to the risks associated with rafts slipping or colliding at the top of the conveyor near the unload platform were ever conducted.[165]

129. According to Mr. Ritchie, in early 2015, Mr. Deaves highlighted the need to upgrade the conveyor system for the TRRR, during the course of an Engineering Management Team meeting.[166] Mr. Ritchie was not aware of any previously identified hazards or concerns at the top of the conveyor, nor had he been tasked to review the safety mechanisms in that area.[167] It was discussed during this meeting that the upgrade would consist of a replacement of the conveyor chain, the design of an anti-rollback system and an upgrade to the control system, which included a chain break alarm and a safety Programmable Logic Controller (PLC).[168]

130. Mr. Ritchie subsequently prepared a scope of work for the project, which was intended to deal with control systems for the conveyor only, and included the following upgrades:

- Installation of sensors to monitor the movement of the conveyor system to detect a 'chain break', and to 'detect the presence of a raft at the bottom of the conveyor'.[169] The Safety PLC to be used was intended to control the stopping and starting of the conveyor, monitor for Chain Break of the conveyor, monitor the position of rafts at the bottom of the conveyor, and interlock with the main pumping system.[170] *It was noted that the PLC should also be adaptable to 'control and monitor the pumping systems along with the arrival and dispatch gates (stage 2)'.*[171]

- The existing lanyard emergency stop devices were to be adapted along with the existing local control panels to fit with the new control system.

[162] Ex C4(5), pg. 571
[163] Ex B12(10) & (11)
[164] Ex B3C(46), pg. 35 - 37
[165] Ex B3C(46), pg. 46 & 47
[166] Ex B3A(18), [94] & [95]
[167] Ex C6(27), [60]
[168] Ex B3A(18), [96]
[169] Ex B12(11), pg. 1
[170] Ex B12(11), pg. 1
[171] Ex B12(11), pg. 1

TRRR CONVEYOR CONTROLS UPGRADE OVERVIEW - EX B12 (11), PG. 2

131. It was also proposed that the scope of work be expanded to include an upgrade of the Main Control Panel, as it had been *'adapted and added to over many years and are in a poor state'.*[172] Mr. Ritchie clarified that he was referring to the organisation of the wiring on the Main Control Panel as it was difficult to follow and untidy.[173] The hardware was older and there was no colour coding, numbering, labelling or features that would be expected for new wiring that readily identifies the systems that each wire operates.[174] Furthermore, there were no 'as built' electrical drawings, as well as different electrical components that had different voltages in the same system.[175] Mr. Ritchie noted that these aspects made reviewing the electrical components of the Main Control Panel '*slow and time consuming'*.[176] He did not consider, however, that the state of the control panel adversely affected the safety or operation of the ride.[177]

132. This upgrade was intended to include the following:[178]

- The addition of a 7-inch Proface Touch Screen which would monitor all alarms, monitor the water level and monitor the pump loads; and

- Upgrade the controls of all arrival and exit gates.

133. It was estimated that the additional cost for this further component to the upgrade, which would '*future proof this system for years to come*' was $10,000.[179] Mr. Ritchie was of the view that this increase to the scope of work would allow for the necessary infrastructure to make the ride capable of future automation projects, which may be considered, and would also improve the state

[172] Ex B12(10)
[173] Ex C6(28), [13]
[174] Ex C6(28), [13]
[175] Ex C6(28), [13]
[176] Ex C6(28), [14]
[177] Ex C6(28), [15]
[178] Ex B12(10)
[179] Ex B12(10); Ex C6(28), [29]-[31]

of the wiring at the Main Control Panel, which would enable faster electrical fault finding in the future.[180]

134. In relation to the monitoring of the water level at the TRRR, Mr. Ritchie was of the view that water level sensors could be installed, which would monitor the operating efficiency of the pumps.[181] He was aware that the pumps for the TRRR accounted for approximately 30% of Dreamworld's overall electricity bill, and such monitors may allow for the performance of the pumps to be adjusted to increase or decrease the operating capacity, thereby leading to a significant cost saving.[182]

135. This memorandum was sent to Mr. Deaves by Mr. Ritchie via email.[183] Subsequent discussions were had whereby Mr. Deaves advised that whilst he supported the additional work proposed, it could not proceed at this stage, with the focus to remain on the upgrades to the bottom of the conveyor.[184] Mr. Ritchie understood that the potential hazard identified at the bottom of the conveyor needed to be rectified as a priority.[185] He did not consider that a delay to the second stage of the project would have a negative impact on guests' or Operator's safety.[186]

136. Quotes were subsequently sought from Products for Industry (PFI) and Sage Automation.[187] Ultimately, PFI was engaged to carry out the upgrades to the TRRR, which included the following:[188]

- Design the electrical integration of the PLC to perform the following functions:
    - Conveyor start/stop Operating including jogging and override controls
    - Chain Break Detection
    - Raft Slip Detection
    - Monitoring of the Lanyard Emergency stops
    - Monitoring of the emergency stop at the local control panel
- Replace the Existing Local Control panel
- Run new cabling to the local control panel and the ride control station
- Install the Raft position spot 10 safety beam at the bottom of the incline conveyor
- Install the Chain Break spot 10 Safety Beam further up the incline to monitor the wooden cleats on the chain

[180] Ex C6(28), [20]
[181] Ex C6(28), [23] & [24]
[182] Ex C6(28), [25]
[183] Ex C6(28), [32]
[184] Ex C6(28), [37] & [38]
[185] Ex C6(28), [49]
[186] Ex C6(28), [49]
[187] Ex F1(13), pg. 1; Ex B16D(6)
[188] Ex B12(9)

- Supply all required electrical hardware and software
- Replace the existing local control panel with new panel & controls and incorporate a new safety reset button
- Build and install a new Safety PLC Panel to install in the main electrical control room
- New Safety PLC panel to incorporate redundant safety contactors
- Also incorporate to interrupt the drive enable signal to stop the drive before isolating safety contactors
- Program and Commission the Safety PLC
- Perform Safety Validation of the system and documentation

137. The purpose of these upgrades was to ensure that if a raft was stationary at the base of the ride, it was detected and it would shut the conveyor drive down.[189] Detection of a break in the conveyor chain was also designed as part of the upgrade, which by way of a sensor would shut down the conveyor motor.[190] The plate and wiring of the local motor Control Panel was also replaced, with an upgraded E-Stop installed at the unload area, which immediately stopped the conveyor.[191] The controls for the conveyor at the Main Control Panel were also rewired as part of the upgrade.[192]

138. With respect to the function of the E-Stop, Mr. Ritchie consulted with Systems Administrator, Ms. Horton, as to whether it should stop one of the pumps or the conveyor.[193] It was determined that given the ability of the unload Operator to see the conveyor and any associated issues, it would be best if the E-Stop only allowed for a hard stop of the conveyor, with control of the pumps retained by the Operator at the Main Control Panel.[194]

139. PFI was not asked to install a water level monitor on the TRRR.[195] It was noted that there was a request in the scope of works to include a pump interlock in Stage 2 of the upgrade, however, there was no date stipulated as to when this would commence.[196] Mr. Ritchie notes that these upgrades were discussed during the site visit conducted by PFI in August 2015, however, were not to be implemented until after the first upgrade had been successfully implemented.[197]

[189] Ex C4(12), [21]
[190] Ex C4(12), [22]
[191] Ex C4(12), [24]
[192] Ex C4(12), [25]
[193] Ex C6(28), [168] – [170]
[194] Ex C6(28), [170]
[195] Ex B3C(43), [13]
[196] Ex B3C(43), [15]
[197] Ex B3A(18), [101]

140. The conveyor upgrades were commenced on 8 February 2016, and completed within a week.[198] In March 2016, PFI was requested to return to site and make the following modifications to the system:[199]

- Raft stop timer to be extended by 15 seconds at the bottom of the conveyor;
- Installation of an audible alarm on the Operator's Panel if the conveyor failed;
- Syncing the emergency dispatch gate with the audible alarm if the conveyor stopped to automatically shut the dispatch gates to prevent the further dispatch of rafts;
- Ride enable key must be in to start the conveyor; and
- Location of chain break sensors lowered by 20 mm.

141. Changes to the relevant management documents relating to the TRRR following the above modifications were completed by Mr. Ritchie and Mr. John Lossie at the request of Mr. Deaves.[200] These documents included technical drawings of the work completed, changes and updates to the operating procedures, changes to the service and maintenance procedures and task sheets, as well as details as to the training to be undertaken by the Operator.[201] Two additional checks were added to the daily and weekly maintenance checklists for the TRRR following the modifications.[202]

142. A completion memorandum was subsequently completed by Mr. Ritchie, which was provided to E&T staff only, which explained the changes to the conveyor control system.[203] On-site training was also provided to E&T staff by Mr. Ritchie demonstrating the changes made as detailed in the completion memorandum. It is unclear if any records were retained detailing who undertook this training and were provided with the memorandum.[204]

143. During the inquest, Engineer, Mr. Matthew Sullivan from PFI, gave evidence that some of the spare safety inputs available following the conveyor upgrade could have been used for a safe water level monitoring system.[205]

PFI Modifications to the Log Ride in 2013

144. PFI had previously been engaged by Mr. Deaves to undertake upgrades to the Log Ride in October 2013, which included the installation of a water level monitor by way of two probes sending an electric signal to the PLC that registered the level.[206] It was noted that the water monitoring was an '*important feature'* of the Log Ride as it was crucial to stopping the boats as they came off the conveyor.[207]

[198] Ex C4(12), [28]
[199] Ex B3C(38), [47] & [48]; Ex F1(4)
[200] Ex B3A(18), [112] & [114]
[201] Ex B3A(18), [112]
[202] Ex B3C(53), pg. 21 & 22; Ex E(242)
[203] Ex C6(28), [172]
[204] Ex C6(28), [173]
[205] T16-27, lines 3-35
[206] Ex B3C(43), [8] & [9]; Ex C4(12), [10]; Ex B3C(46), pg. 49
[207] Ex B3C(43), [10]

Mr. Deaves claims that these upgrades came about after he reviewed the ride controls to consider having one Operator instead of two.[208] He was made aware of concerns as to a raft coming over the top of the conveyor and colliding with another at 70 kmph, and thought that a control system would be necessary to prevent this from occurring.[209] He subsequently approached PFI to have it designed. Mr. Deaves describes the manner in which this upgrade came about as 'ad hoc' and in passing, rather than by way of a formal meeting or identified risk, which needed to be rectified.[210]

145. The scope of work also included monitoring the movements of the boats at the top and bottom of the slide, which was to avoid collisions by way of block controls.[211]The purpose of these controls was to ensure that only one boat entered an area at any given time by way of a sensor at the start and exit point of a designated area.[212] On the Log Ride, this included a block control at the top of the slide and another at the bottom, which was designed to prevent a boat being at the base and another coming towards it and resulting in a collision.[213]

146. The cost of all of the modifications to the Log Ride, which in addition to the above also included manual reset buttons and overrides, was $16,000.[214]

Other Suggested Modifications to the TRRR

147. Records provided by Ardent Leisure during the course of the coronial investigation suggest that further modifications were considered for the TRRR. Unfortunately, these documents were provided without any context or further records explaining the content or reasoning as to why modifications were examined, nor the decision not to proceed. For completeness, and to highlight the proposed changes, details as to the modifications are outlined below.

Automated Raft Rotation System

148. Minutes from the Executive Safety Committee Meetings held in February 2004, suggest that consideration was given to a redesign and costing of an automated raft rotation system, which was to be included in the 2005 budget.[215] It appears that Mr. Tan and Mr. Angilley were responsible for this project. Unfortunately, whilst this project is subsequently mentioned in minutes from a further meeting in September 2004, it is not clear why this project did not proceed. In the minutes from the September meeting, it states that *'issue to be reviewed Feb' 05. Meantime operator training techniques to be used'.*[216] Whilst the issue remains an agenda item for the November 2004 meeting, the notation states, *'design and costing required for an automated raft rotation system. Work in progress in light of recent events'.*[217] It is not clear what the context of this notation was, and why the project did not eventuate.

[208] Ex B3C(46), pg. 50
[209] Ex B3C(46), pg. 50 & 51
[210] Ex B3C(46), pg. 50 & 51
[211] Ex C4(12), [6]
[212] Ex C4(12), [6]
[213] Ex C4(12), [6]
[214] Ex C4(12), [11]
[215] Ex C9(82)
[216] Ex C9(86)
[217] Ex C9(88)

Single Button Shutdown

149. According to Ms. Horton, she made a suggestion that a single stop button be installed on the TRRR, as opposed to the four button shutdown sequence, which needed to be undertaken by the Ride Operator at the Main Control Panel.[218] Whilst this proposal wasn't made due to any safety concerns, Ms. Horton thought this would make the process simpler for Ride Operators.[219]

150. On 6 May 2016, an email was sent from Mr. Jason Johns on behalf of the 'Dreamworld Attractions Supervisors' to Mr. Lossie and Mr. Fyfe, which raised the possibility of the four step emergency shutdown procedure for the TRRR being changed to one step.[220] The four steps taken to shut down the ride were as follows:

I. Press Emergency Gate Button;

II. Press Conveyor Stop;

III. Press Emergency Stop; and then

IV. Press Rapid Ride alarm button.

151. On the same day, Mr. Lossie replied stating that he would *'look into what would be required for this to be a one push button'.*[221]

152. According to Mr. Johns, this request was made at the behest of Mr. Fyfe, who asked that he explore the possibility of simplifying the shutdown process.[222]

153. Prior to the tragic incident, this simplification of the shutdown process had not been implemented on the TRRR. At the inquest, Mr. Johns confirmed that he had not received any further correspondence about the issue, however, he acknowledged that it was not actioned.[223]

Sourcing Further Wood for Conveyor in 2016

154. An email from Mr. Naumann to Gooding Timber dated 30 March 2016, suggests that pricing was sought for 70 lengths of F14 Hardwood timber.[224] A representative from Gooding Timber subsequently queried whether the wood was being used for inside or outside, as this would be relevant to determining the most suitable product.

155. When questioned as to how and why this quote was sourced during the inquest, Mr. Naumann stated that he thought it may have been based on his assessment of what was required and also previous ordering history.[225] He 'wasn't sure' whether it would be pivotal to advise the supplier that the wood was being used for a water based amusement ride.[226]

[218] Ex B3C(27), [8] & [9]
[219] Ex B3C(27), [12]
[220] Ex F12(853), pg. 2
[221] Ex F12(853), pg. 1
[222] T15-77, lines 5-25
[223] T15-78, lines 27-45
[224] Ex E(76)
[225] T11-49, lines 1-15
[226] T11-49, lines 15-20

156. In an update email sent by Mr. Naumann to Mr. Watkins and Mr. Cox dated 6 May 2016, he noted that *'we have started alternating the planks on installation – new then, good condition old'.*[227] When asked for the rationale as to this approach to replacing the planks, Mr. Naumann was unable to recall the reasoning.[228] He did state, however, that to the best of his recollection, conveyor slats with 'excessive bowing' were replaced during the 2016 annual shutdown of the TRRR.[229]

TRAINING & OPERATOR PROCEDURES

157. For each of the rides at Dreamworld, specific Operating Procedure Manuals were drafted by the Operations Department, with final approval provided by Mr. Margetts. Memorandums were also used to update the Operating Procedures for each ride. These were displayed on a memorandum board.[230] Ride Operators were then retrained on the change in procedure, which was noted on a roster kept with the Supervisors.[231]

158. For each of the attractions at Dreamworld, ride specific training was provided in-house to new Ride Operators.[232] This was undertaken by Senior Ride Instructors (level 4), who were experienced Ride Operators that had been trained in each level of ride operation.[233] It does not appear that they were required to hold any formal training qualifications or undertake any external course, which would be recognised outside of the Theme Park. That being the case, evidence suggests that internal courses were offered for Instructing Operators, such as the 'Train the Trainer', which was conducted at Dreamworld in mid-2016 for all of the Instructing Operators.[234] This course was conducted one day a week for three hours over a 10 week period.[235]

159. Senior Ride Instructors were required to provide instruction to Ride Operators safely and efficiently, whilst also mentoring and training staff on an as required basis.[236] They were also expected to identify and report methods for continuous improvement within the Department and business, as well as any hazards or incidents as identified.[237] One of the key responsibilities of an instructor was to maintain Dreamworld's high standards of practice and safety by ensuring '*that your trainee is aware of these safety commitments and they are appropriately trained in all safety matters*'.[238]

160. Instructors were required to have one to two years' exemplary performance in ride operation.[239] However, evidence provided by various staff during the investigation and inquest suggested that there was no enforced set timeframe as to when a Ride Operator could progress to becoming an Instructing Operator. For example, Ms. Amy Crisp progressed to a training position within a year of commencing her employment as a Ride Operator with Dreamworld, although she

[227] Ex E(91)
[228] T11-49, lines 20-32
[229] T11-79, lines 5-30
[230] Ex B3A(21), pg. 20
[231] Ex B3A(21), pg. 21
[232] Ex B3A(11), [4]
[233] Ex B3A(14), pg. 3
[234] Ex C6(46), [20]
[235] Ex C6(46), [20]
[236] Ex B12(3), pg. 1
[237] Ex B12(3), pg. 2
[238] Ex B12(4), pg. 10
[239] Ex B12(3), pg. 2

noted that it normally took staff longer to achieve this.[240]

161. Practically, before a Ride Operator could become an Instructing Operator, they were required to watch other training sessions provided to staff, and would then be observed on at least three different training sessions they provided to new Ride Operators.[241] Once the trainer is deemed to be competent by senior staff, they are allowed to train Ride Operators without supervision.[242]

162. If an Instructor discovers an issue with a procedure or a correction, which needs to be made, there is a suggestion form that can be completed and provided to a Supervisor to be actioned.[243]

163. Instructors were also involved in the auditing of staff, to ensure Ride Operators were still competent and to identify whether any further training may be required.[244] This generally involved computer based and practical on-site observation of the Ride Operator.[245]

164. At the time of the incident, it was estimated that there were eight Instructing Operators, six of whom were competent to train all staff on all rides. The Log Ride and TRRR were the last rides that were taught to Ride Operators and Instructors, due to the '*higher responsibility*'.[246]

165. The manner in which this training was provided by the Instructing Operator was largely based on how and what the Instructor had been shown when they were a Ride Operator, and comprised of on-site practical training whilst the ride was in operation with the Instructor, with a run through of the procedures specified in the applicable operating procedure manual discussed and demonstrated before the ride opened.[247] There was no checklist provided to the Instructor as to topics to be covered during a training session for the ride, rather only a Training Register, which was signed off at the end of the session.[248] The Operating Procedure Manual for a ride was intended to outline the processes to be followed when operating the ride and responding to different scenarios that may arise, including emergencies specific to that attraction. The duration of the training largely depended on the type and complexity of the ride. Trainers were required to make an assessment of the trainee to determine if they were comfortable operating the ride.[249]

166. When training a staff member in the operation of a ride, it was a requirement of Dreamworld policy that a 'Training Register' sheet be completed in full.[250] This form states the day and time the employee was trained in a particular role on a ride, and was only to be signed by the trainee if '*they are confident that they know and understand the procedure*'.[251] The instructor is also only to sign the form if they are '*confident that the operator knows and understands the procedure and is able to operate the ride confidently*'.[252] In the Instructor Handbook developed

[240] Ex B3A(14), pg. 5
[241] Ex B3A(14), pg. 4
[242] Ex B3A(14), pg. 4
[243] Ex B12(4), pg. 6
[244] Ex B3A(14), pg. 6
[245] Ex B3A(14), pg. 9
[246] Ex B3A(14), pg. 7
[247] Ex B3F(3), [5]
[248] Ex B3A(14), pg. 22 & 23
[249] Ex B3A(14), pg. 9
[250] Ex B12(4), pg. 5
[251] Ex B12(4), pg. 5
[252] Ex B12(4), pg. 5

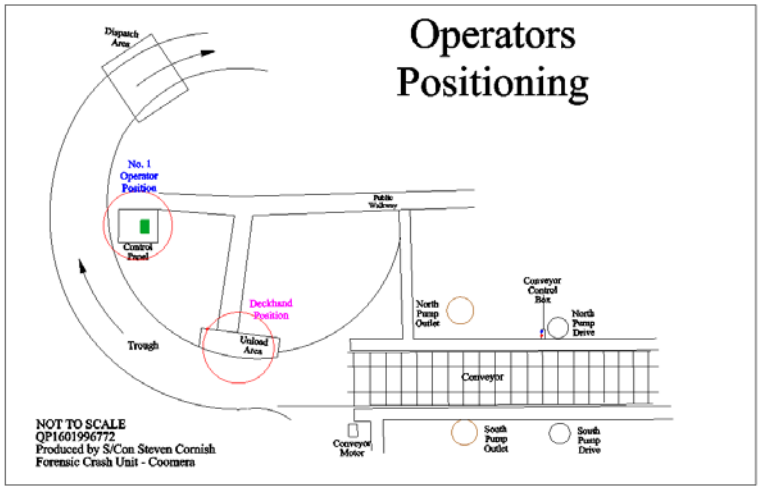
by Dreamworld, there is advice provided to Instructors as to the different adult learning styles and modalities.[253]

167. The different levels of Operators on a ride indicate the different levels of training and familiarity and seniority in relation to rides. There are requirements as to what level a Ride Operator must be to work on particular rides, with some simple rides only requiring a level 1 Operator.

168. Any change in procedure for a ride, requires that the Ride Operators be briefly re-trained on the new procedure (usually within 15 minutes), which would be recorded in a Training Register.[254]

TRRR Position Responsibilities and Training

169. It was well-known that the Tower of Terror, Log Ride and TRRR were the most complex rides to operate within the Theme Park, as the Ride Operators had the most responsibility. Accordingly, a Level 3 (No. 1) Operator was necessary to control the ride.[255] Like the Log Ride, the TRRR was said to have a number of manual elements to its operation as opposed to automated controls, which made the ride more difficult to operate.[256] The panel for the ride was described by Relief Supervisor, and experienced Ride Operator, Ms. Cotter as being a *'very complex panel'.*[257]



170. At the TRRR, there were three possible Operator positions, with a maximum of four staff manning the ride on a given day. The number of staff required to operate the ride was dependent on the number of rafts in circulation, and the expected volume of guests.

171. The staffing positions and configuration, which are detailed in the Operator Procedure Manual for the ride, were as follows:[258]

[253] Ex B12(4), pg. 7-9
[254] Ex C7(541); Ex B3A(11), [69]
[255] Ex B3A(21), pg. 12; T6-95, lines 30-40
[256] Ex B3A(21), pg. 12 & 13; T6-96, lines 1-5
[257] T6-96, lines 5
[258] Ex D4(102), pg. 4, sections 3.3.1 Operator Procedure Manual – Load Operator & Ex D4(103), pg. 6

2 staff present (operator and load operator)

(i) 1 at main control panel (load)
(ii) 1 at unload

3 staff present (operator, load and deckhand)

(i) 1 at main control panel (load)
(ii) 1 at unload
(iii) Deckhand at dispatch and roving queue line and assisting with ride express

4 staff present (operator, load and deckhands)

(i) 1 at main control panel (load)
(ii) 1 at unload
(iii) Deckhand 1 at dispatch
(iv) Deckhand 2 roving queue line and assisting with Ride Express

172. The responsibilities for each position were outlined in role specific Operator Procedure Manuals. The duration of the training provided for each position is dependent on the level of responsibility. Primary responsibility for the operation of the ride remained with the Level 3 Operator (No. 1), who also had a supervisory responsibility over the Level 2 and Level 1 Operators.[259]

173. Ms. Horton was responsible for drafting updates to the Operator Procedure Manual for the TRRR, which came into effect in June 2016.[260] The reason for the updates to the procedure was to reflect recent engineering changes to the conveyor operating system, which prevented rafts from rolling back on the conveyor.[261] All Operators were subsequently trained in the draft and implemented changes to the Operator Procedure Manual.[262] At inquest, Ms. Horton stated that whilst she considered the entire contents of the Procedure Manual, she wasn't aware of any associated memorandums that may be applicable, as these had not been saved on the document management system, Liferay.[263] The Safety Department was not involved in the drafting of any operating procedures.[264]

174. In order to demonstrate the time-frame in which the Operators for the TRRR had to perform their respective functions and tasks, the following table demonstrates the cycle times for the ride, as was documented within the operating procedures maintained at the ride:[265]

AVERAGE CYCLE TIMES

	Cycles per hour	Guests per hour	Minutes per cycle
Non Holiday	83.4	458	0.72
Holiday	113	626	0.5

[259] Ex B3A(2), pg. 5; Ex D4(102), pg. 4
[260] Ex B3C(25), [3]; Ex B3C(26), [3]
[261] Ex B3C(25), [3]
[262] Ex B3C(26), [7]
[263] T25-21, lines 5-35
[264] T25-24, lines 40-48
[265] Ex F19(1), pg. 5

175. The roles and responsibilities of each of the Operator positions at the ride are outlined below.

Ride Operator Level 1 (No. 3) Deckhand

176. The Operations Procedure Manual (Rapid Ride Deckhand Operation) states that the Deckhand will be positioned at the dispatch control panel and queue line, to ensure all guests' belts are secured, and to press and hold the dispatch jack button until the raft has left the jacks.

177. As part of the Operator Procedure Manual, there was also a Rapid Ride Operator Training component.[266] This document seems to apply to the training of the Deckhand position at the TRRR. Section 3.2 of the procedure requires that the training session should be a minimum of 1.5 hours, with 3.2.2 stipulating that Instructing Operators and Attractions Supervisors '*must never leave any person to operate any equipment unless fully competent. If any doubt exists as to the trainee's level of competence, the Instructor is to extend the duration of the training session.'*[267] Sections 3.4 of the Procedure requires that the operating procedures as outlined in the manual be explained, as well as '*all of the emergency and operational/Code 6 procedures*' (3.4.6).[268] The assessment is to ensure that the trainee knows and understands each of the points covered in the training session and once satisfied, the instructor is to assess the trainee's competency through at least two ride cycles before signing the Attractions Training Register.

178. The Operating Procedure Manual for the Deckhand position is five pages in length.[269] The relevant portions for the purpose of this coronial investigation are as follows:

> ***3.1.6 No 1 operator will ensure deckhand/s are aware of the following:***
>
> *(i) How to shut down the ride as per 3.4.4*
> *(ii) Location of telephones to call for assistance and the Emergency telephone number (222)*
> *(i) How to advise guests of delay*
> *(ii) Location of all emergency equipment, Emergency exits, and Evacuation Zones*
> *(iii) Number of rafts in circuit*
>
> ***3.2 Start Up***
>
> *3.2.1 No.1 Operator is responsible for the startup of the ride*
> *3.2.2 Check with No. 1 Operator for any specific operating instructions for the day*

[266] Ex C6(47), pg. 9
[267] Ex C6(47), pg. 10
[268] Ex C6(47), pg. 10
[269] Ex D16(6), pg. 1-5

3.4 Operating Problems

3.4.1 Any operating problems must be reported immediately to the No. 1 Operator. No raft should be dispatched if it has the potential for risk to either:

(i) Guest/Staff safety or wellbeing
(ii) Ride operating conditions
(iii) Damage to ride equipment

3.4.3 No. 1 Operator initiate shut down

Advise the No.1 Operator immediately if any of the following problems arise. No.1 Operator will ensure the rapid ride is shut down in the event of any of the following

(i) Loss of power to one or both pumps
(ii) Loss of power to the conveyor
(iii) Conveyor chain break
(iv) Raft stall bottom of conveyor
(v) Raft jam
(vi) Raft slips on the conveyor
(vii) Load/unload jacks jam closed
(viii) Any situation where there is a risk of serious injury to guests or Staff
(ix) Any situation where there is risk of damage to ride equipment

3.4.4 Shut Down Operation

No. 1 Operator and or a Supervisor may direct Deckhand to shut down the ride in an emergency. Proceed to:

(i) Press Emergency Gate Button
(ii) Press Conveyor stop
(iii) Press Emergency stop
(iv) Remove dispatch isolator key
(v) Call control via 325 stating the nature of your call
(vi) Await further instructions from a Supervisor

3.5 Periodic Checks
3.5.1 Monitor raft air pressure and condition of tubes. Report any faults or problems to No. 1 Operator.
3.5.2 Monitor water level. Report any faults or problems to No. 1 Operator
3.5.3 Monitor the operation of all jacks. Report any faults or problems to No. 1 Operator
3.5.4 Monitor the queue lines for guests under the age of 2 years and Ride Express queue line
3.5.5 Monitor the ride for unusual sounds or smells during normal operation. Report any faults or changes to No. 1 Operator
3.5.6 Ensure that the ride and the queue line areas are kept clean and tidy at all times

179. Although the responsibilities of the Deckhand are limited and the training relatively short, it appears from the requirements of the procedure that the

employee is required to be conversant with their responsibilities in respect of the above competencies.

180. None of the prescribed procedures for this position give the Deckhand the authority to take action in an emergency situation, without the direction of the No. 1 Operator.

Ride Operator Level 2 (No. 2) Load Operation

181. The training for a No. 2 Operator on any given ride generally involved training on-site for between 1 ½ to 2 hours, which was consistent across the Theme Park.[270] However, if an Instructing Operator was of the view a trainee required additional time to complete the training to the requisite level, this could be requested.[271]

182. According to the 'Attractions Training Register' for the No. 2 Operator position at the TRRR, Parts 3.1-3.8 of the Operator Procedure Manual were required to be canvassed during training.[272] These sections of the Manual cover the following topics:

- 3.1 – Opening
- 3.2 – Start up
- 3.3 – Operating
- 3.4 - Operating Problems
- 3.5 – Periodic Checks
- 3.6 – Emergency
- 3.7 – Closing
- 3.8 – Spiels
- Lock-out tag-out

183. The Operating Procedure Manual for the No. 2 load Operator position is 16 pages in length.[273] The relevant portions of the Manual for the purpose of this coronial investigation are as follows:

> ***3.1.7 Operator will ensure load operator is aware of the following***
>
> *(i) How to shut down the ride in the event of an Emergency where the No. 1 Operator is incapacitated (shut down procedure)*
> *(ii) Location of the telephones to call for assistance and the Emergency telephone number (222)*
> *(iii) How to advise guests of a delay*
> *(iv) Location of all Emergency equipment, Emergency exits, and evacuation zones*
> *(v) Number of rafts in circuit*
>
> ***3.2 Start Up***
>
> *3.2.1 No. 1 Operator is responsible for the start up of the ride*
> *3.2.2 Check with No. 1 Operator for any specific operating instructions for the day*

[270] Ex B3A(21), pg. 11; Ex C7(541); Ex B3A(2), pg. 4
[271] Ex B3A(14), pg. 16
[272] Ex C7(541), pg. 6
[273] Ex D4(102)

3.2.3 Assist No. 1 Operator in dispatching rafts for test run
3.2.4 Open the Queue at the prescribed opening time

3.3.1 Staff positioning
…

NOTE: The No. 1 Operator is responsible for the operation of the ride including the actions of load operator and deckhand/s. The Operator will be vigilant of operators and ensure all staff rotate positioning (where possible).

3.3.7 Load Operation (positioned main control panel)

3.3.8 Advise guests to remain behind yellow line until directed to enter
NOTE: Operators must ensure rafts are positioned correctly for guests to enter/exit safely. Operators may press jack buttons to turn rafts for correct positioning as necessary. Under no circumstances are guests permitted to climb over seats to load/unload.

3.3.9 Advise guests load spiel as per section 3.8.1. Ensure guests are advised to take care when boarding the raft as the floor may be slippery and request back/rear seats be filled first
3.3.10 Ensure guests load the raft one at a time
3.3.11 Fill every raft where possible utilising guest from the single/pairs and Ride Express queue lines
3.3.12 Ensure belt extensions are given to adults accompanying children if required

NOTE: Ensure the raft is balanced evenly

3.3.13 Ensure loose belongings are stored in the centre of the raft
3.3.14 Advise guests of belt instructions spiel as per 3.8.2
3.3.15 Check all belts are secured correctly

NOTE: A raft must not be dispatched until all belts are secured…

3.3.16 Advise guests of dispatch spiel as per section 3.8.3…
3.3.17 Press 'load' jack button on the main control panel (bar)
3.3.18 Hold 'load' jack button until the raft has left the jacks

NOTE: to ensure adequate raft spacing, the 'dispatch' jack has an automatic minimum 35 sec delay. 'Load 2' button will illuminate once raft is ready for dispatch. Rafts are unable to be dispatch until the 'Load 2' button (dispatch) illuminates and an audible alarm sounds.

3.3.19 Press and hold 'Load 2' button (dispatch) on the main control panel until the raft has left the jacks

NOTE: Jacks will automatically close once raft passes dispatch jack

NOTE: Minimum three rafts must be kept within sight of the No. 1 operator at all times. This is the area between conveyor and

dispatch area.

3.3.20 Load Operators must ensure they are watching camera. Cameras must be checked prior to each raft being sent and in any lag time between rafts being sent. Load Operators must be vigilant of raft movements, conveyor operation and ensure no obstructions exists. If in doubt of operating conditions, stop dispatching. Contact a Supervisor via Control stating 'Rapids – Operational' and await further operating instructions.

3.3.21 Unload operation (positioned unload control panel)

3.3.22 Advise guests to remain seated with belts secured until the raft completely stops at the unload area (exit)
3.3.23 Once the raft stops at arrival jack, press 'arrival jack' button. This will move the raft to the unload
3.3.24 Monitor the raft as it moves through, again advise guests to remain seated with belts secured until the raft completely stops at the unload area (exit)

NOTE: Operators must ensure rafts are positioned correctly for guests to enter/exit safely. Operators may press jack buttons to turn rafts for correct positioning as necessary. Under no circumstances are guests permitted to climb over seats to load/unload

3.3.25 Advise guests of unload spiel as per section 3.8.4
3.3.26 Farewell all guests as they exit
3.3.27 Visually check no rubbish or loose items are left in the raft. Remove as necessary
3.3.28 Press 'unload' jack button. This will move the raft to the load area.
3.3.29 Hold 'unload' jack button until the raft has left the jacks
3.3.30 Repeat sections 3.3.2 to 3.3.30 for daily operation

3.4 Operating Problems

3.4.1 Any operating problem must be reported immediately to the No. 1 Operator. No raft should be dispatched if it has the potential for risk to either:

(i) Guest/Staff safety or well being
(ii) Ride operating conditions
(iv) Damage to ride equipment

3.4.2 Operator Initiate Shut Down

Advise the Operator immediately if any of the following problems arise. Operator will ensure the rapid ride is shut down in the event of any of the following:

(i) Loss of power to one or both pumps
(ii) Loss of power to the conveyor
(iii) Conveyor chain break
(iv) Raft stall bottom of conveyor

(v) Raft jam
(vi) Raft slips on the conveyor
(vii) Load/unload jacks jam closed
(viii) Any situation where this is a risk of serious injury to Guests or Staff
(ix) Any situation where there is risk of damage to ride equipment

3.4.3 Shut Down Operation

No. 1 Operator and or a Supervisor may direct load operator to shut down the ride. Proceed to:

(i) Press Emergency Gate Button
(ii) Press Conveyor stop
(iii) Press Emergency stop
(iv) Remove dispatch isolator key
(v) No. 1 Operator will give direction to load operator attend the bottom of the conveyor and talk with guests until Engineering and Supervisors attend
(vi) If a deckhand is present No.1 Operator will give direction to attend to the queue line and apologise to the guests as per 3.8.5
(vii) Await further instructions from a Supervisor

NOTE: persons in water and or Raft capsized. Follow emergency procedure sections 3.6.2

3.4.4 Two (2) Rafts Dispatched Together

(i) Press emergency gate button
(ii) Stop dispatching
(iii) Advise the No. 1 Operator
(iv) Monitor raft movements via video camera
(v) Await further instructions from No. 1 Operator and/or Supervisor

3.4.5 Loss of Air Pressure (Low air alarm)

(i) Advise the No. 1 Operator
(ii) Stop dispatching
(iii) Await further instructions from the No. 1 Operator

3.4.6 Motor over Current

NOTE: Audible and visual alarm will activate when current is over 500 amps

(i) Advise the No. 1 Operator
(ii) Stop dispatching
(iii) Await further instructions from the No. 1 operator

3.4.7 Video Monitor Failure

(i) Advise the No. 1 Operator
(ii) Stop Dispatching
(iii) Await further instructions from the No. 1 operator

3.4.8 Raft stall bottom of conveyor

NOTE: conveyor will automatically stop in the event of a raft stalling at the bottom of the conveyor. An audible alarm will be heard from the panel and conveyor reset button will illuminate

(i) Advise the No. 1 Operator
(ii) Stop dispatching
(iii) Await further instructions from the No. 1 Operator

NOTE: Operators are not permitted to restart the conveyor. This must be done by Engineering and/or Supervisors

3.4.9 Conveyor chain break

NOTE: Conveyor will automatically stop in the event of a chain break. An audible alarm will be heard from the panel and conveyor reseat button will illuminate

(i) Advise the No. 1 Operator
(ii) Stop dispatching
(iii) Await further instructions from the No. 1 operator

NOTE: Operators are not permitted to restart the conveyor. This must be done by Engineering and/or Supervisors

3.5 Periodic Checks

3.5.1 Monitor raft movements, conveyor operation and ensure nothing is obstructing the video monitor images. If in doubt of operating conditions, stop dispatching and advise the No. 1 operator
3.5.2 Monitor cameras and load/unload platforms for persons in water and or raft capsized. Follow procedure 3.6.2
3.5.3 Monitor rafts loading onto the conveyor and/or conveyor failure. Advise the No. 1 Operator if an operating problem arises
3.5.4 Monitor raft air pressure and condition of tubes. Report any faults or problems to No. 1 operator
3.5.5 Monitor water level. Report any faults or problems to the No. 1 operator
3.5.6 Monitor the operation of all jacks. Report any faults or problems to No. 1 operator
3.5.7 Monitor North and South pump amps. If a pump readout is above 500 amps advise the No. 1 operator
3.5.8 Monitor the queue line for guests under the age of 2 years
3.5.9 Monitor the ride for unusual sounds or smells during normal operation. Report any faults or changes to the No. 1 Operator
3.5.10 Monitor the control panel. Report any faults or changes to the No. 1 operator
3.5.11 Ensure that the ride and the queue line areas are kept clean and tidy at all times
3.5.12 Monitor all riders during a cycle via the video monitor system. Report any concerns to the No. 1 operator
3.5.13 Ensure video monitor displays all camera images at all times. Report any faults or changes to the Operator

3.5.14 Monitor weather conditions. A Supervisor and/or the No. 1 Operator may advise to dispatch less frequently
3.5.15 Monitor ride express queue line and incorporate loading guests in daily operation

3.6 Emergency

3.6.1 In the event of serious injury to a guest or staff member contact the Emergency Station

Via telephone

(i) Contact the Emergency Station via telephone '222'

NOTE: Remain calm, speak slowly and clearly

(ii) State 'who you are, where you are and the nature of the emergency'
(iii) Ensure that you are the last to hang up the telephone
(iv) Await for the arrival of the 'Emergency Response Team'
(v) If possible, control any bystanders and/or assist where possible
(vi) Retain any witnesses if possible
(vii) Advise the guests in the queue line of the delay
(viii) Complete all reports

Via two way

(i) Ensure the two way is turned 'on' and transmitting on channel 'one'. Ensure that the two way volume is on high.

…

3.6.2 Persons in water and or Raft Capsized

(i) Press Emergency Gate Button
(ii) Press Conveyor stop
(iii) Press emergency stop
(iv) Remove dispatch isolator key
(v) Press rapid ride alarm button
(vi) Contact the emergency station as per section 3.6.1

NOTE: the dispatch isolator key must be retained by the No. 1 operator at all times when the operator is away from the operator's panel

(vii) Throw a life buoy to the person (if possible)
(viii) No. 1 operator will give direction to attend the bottom of the conveyor throw life buoy

NOTE: Ensure the dispatch isolator is given to the No. 1 Operator before leaving the area

(ix) If a deckhand is present, Operator will direct them to attend the yellow gate, near the Car park B entry, to throw life buoy
(x) Await further instructions from a Supervisor

3.6.3 If the No. 1 Operator is injured or incapacitated load operator will:

(i) Press emergency gate button
(ii) Press conveyor stop
(iii) Press emergency stop
(iv) Contact the emergency station as per section 3.6.1
(v) Stay at the control panel, await further instructions from a Supervisor

NOTE: if a deckhand is present, give direction to proceed to the conveyor to talk with guests and apologise for delay as per 3.8.5

184. Essentially, once the TRRR is operational, the No. 2 Operator has the same tasks and periodic checks as the No. 1 Operator. Both are expected to swap positions from the unload area and the Main Control Panel at regular intervals. The No. 1 Operator, however, retains overall responsibility for the operation of the ride. Unless the No. 1 Operator is incapacitated, or in certain specific circumstances, such as a person is in the water or a raft is capsized, it is clear that the No. 2 Operator does not have authority to complete certain tasks, such as responding to operational issues and shutting down the ride, except at the direction of the No. 1 Operator.

185. The training provided to staff for the No. 2 Operator role involves both verbal and visual instruction on each of the requisite areas whilst at the ride. The trainee is required to read through the Operations Procedure Manual, and any memorandums or addendum to the procedure, which are maintained in a folder at the ride. At the completion of the training, both the trainer and trainee complete and sign the Attractions Training Register.

Ride Operator Level 3 (No. 1)

186. The No. 1 Operator for the TRRR held primary responsibility for the operation of the ride, as well as supervisory duty for the No. 2 and No. 3 Operators.

187. Unlike the other positions for the ride, the training for the No. 1 Operator at the TRRR, consisted of a full day (8 hours approximately), which was carried out onsite with an Instructor whilst the ride was in operation.[274]This training was described by Mr. Nemeth as '*onsite training and they're showing you step-by-step what to do and then you have to demonstrate that you can operate the ride in front of the instructor'.*[275] The Instructor takes the trainee through the operating procedure manual whilst onsite.[276] The following day, the Instructor also observed the No. 1 Operator to open and close the ride.

188. The discrepancy of the training provided to the No. 1 and No.2 Operator is said to reflect the greater responsibility placed on the No. 1 Operator, who is responsible for the operation of the ride, and has some supervisory capacity over the No. 2 Operator.[277] This was generally understood by staff trained in both

[274] Ex B3A(2), pg. 5
[275] Ex B3A(2), pg. 5
[276] Ex C7(18)(a), pg. 43
[277] Ex B3A(21), pg. 15 & 16

positions of the ride.[278]

189. The Operations Procedure Manual for the 'Rapid Ride Operator' consisted of 18 pages.[279]It largely mirrors that of the No. 2 Operator with respect to the load and unloading of guests, however, primary control for the operation of the ride rests with the No. 1 Operator, including decisions as to operational issues and the actions of the No. 2 and 3 Operators.[280]

190. Relevant further portions of the Operating Procedure Manual for the No. 1 Operator are as follows:

> ***3.4 Operating Problems***
>
> ***3.4.1 Any operating problem must be reported immediately to your Supervisor if it has the potential for risk to either:***
>
> *(i) Guest/Staff safety or well being*
> *(ii) Ride operating condition*
> *(iii) Damage to ride equipment*
>
> ***3.4.2 Operator Initiate Shut Down***
>
> *The Rapid ride must be shut down if any of the following occur as directed by a Supervisor*
>
> *(i) Loss of power to one or both pumps*
> *(ii) Loss of power to the conveyor*
> *(iii) Conveyor chain break*
> *(iv) Raft stall bottom of conveyor*
> *(v) Raft jam*
> *(vi) Raft slips on the conveyor*
> *(vii) Load/unload jacks jam closed*
> *(viii) Any situation where this is a risk of serious injury to Guests or Staff*
> *(ix) Any situation where there is risk of damage to ride equipment*
>
> ***3.4.3 Shut Down Operation***
>
> *(i) Press Emergency Gate Button*
> *(ii) Press Conveyor stop*
> *(iii) Press Emergency stop*
> *(iv) Remove dispatch isolator key*
> *(v) Contact control on 325 stating 'Rapid Ride – Code 6' and advise why shutdown was initiated e.g. loss of power to conveyor*
> *(vi) Direct Load operator to attend the bottom of the conveyor*
> *(vii) If a deckhand is present direct them to attend the queue line and advise guests of delay as per 3.8.5*
> *(viii) Count how many rafts are retrieved (from conveyor to dispatch control panel area)*
> *(ix) Await further instructions from a Supervisor*
> *(x) Advise guests of an operational delay as per section 3.8.5*

[278] Ex B3A(12), pg. 10
[279] Ex D4(103)
[280] Ex D4(103), pg. 6

(xi) Record downtime

NOTE: In the event of persons in water and or Raft capsized follow emergency procedure sections 3.6.2

NOTE: Number of rafts in circuit is vital information for shutdown procedure. Supervisors will contact operators to determine exactly how many rafts are left in circuit to retrieve

3.4.4 Two (2) Rafts Dispatched Together

(i) Press emergency gate button
(ii) Stop dispatching
(iii) Contact a Supervisor via Control stating 'Rapid Ride – Operational'
(iv) Monitor raft movements via video camera
(v) Await further instructions from Supervisor

3.4.5 Loss of Air Pressure (Low air alarm)

(i) Stop dispatching
(ii) Contact a Supervisor via control stating 'Rapid Ride – Code 6'
(iii) Press Emergency Gate Button
(iv) Remove dispatch isolator key

NOTE: The dispatch isolator key must be retained by the operator at all times when the operator is away from the operator's panel

(v) Tie the front raft to the deck railing at the end of the dispatch control panel area
(vi) Insert dispatch isolator key
(vii) Retrieve all rafts in circuit
(viii) Unload guests (only if safe to do so)
(ix) Switch off one pump by pressing red pump stop button (north or south)
(x) Advise guests of an operational delay as per section 3.8.5
(xi) Await further instructions from a Supervisor
(xii) Record downtime

3.4.6 Motor over Current

NOTE: Audible and visual alarm will activate when current is over 500 amps

(i) Stop dispatching
(ii) Contact a Supervisor via control stating 'Rapids – Operation ASAP'
(iii) Retrieve all rafts in circuit
(iv) Remove dispatch isolator key
(v) Advise guests of an operational delay as per section 3.8.5
(vi) Await further instructions from a Supervisor
(vii) Record downtime

3.4.7 Video Monitor Failure

(i) Stop Dispatching
(ii) Contact a Supervisor via Control stating 'Rapids – Operational ASAP'
(iii) Retrieve all rafts in circuit
(iv) Remove dispatch isolator key
(v) Advise guests of an operational delay as per section 3.8.5
(vi) Await further instructions from a Supervisor
(vii) Record downtime

NOTE: The Emergency stop button located on the pole at the unload station will stop one pump and the conveyor when pressed

3.4.8 Raft stall bottom of conveyor

NOTE: conveyor will automatically stop in the event of a raft stalling at the bottom of the conveyor. An audible alarm will be heard from the panel and conveyor reset button will illuminate

(i) Press Emergency Gate Button
(ii) Press Conveyor stop
(iii) Press Emergency Stop
(iv) Remove dispatch isolator key
(v) Contact Control on 325 stating 'Rapid Ride – Code 6'
(vi) Direct Load Operator to attend the bottom of the conveyor
(vii) If a Deckhand is present direct them to attend the queue line and advise guests of delay as per 3.8.5

NOTE: Operators are not permitted to restart the conveyor. This must be done by Engineering and/or Supervisors

3.4.9 Conveyor chain break

NOTE: Conveyor will automatically stop in the event of a chain break. An audible alarm will be heard from the panel and conveyor reseat button will illuminate

(i) Press Emergency Gate Button
(ii) Press Conveyor stop
(iii) Press Emergency Stop
(iv) Remove dispatch isolator key
(v) Contact Control on 325 stating 'Rapid Ride – Code 6'
(vi) Direct Load Operator to attend the bottom of the conveyor
(vii) If a Deckhand is present direct them to attend the queue line and advise guests of delay as per 3.8.5

NOTE: Operators are not permitted to restart the conveyor. This must be done by Engineering and/or Supervisor

191. In relation to the Periodic checks, which are set out at 3.7 of the No. 1 Operator Procedure Manual, the requirements mirror those of the No. 2 Operator. The only addition is section 3.5.13, which requires the No. 1 Operator to *'monitor all operator movements, ensure staff rotate operating positions throughout the day*

(where possible).'[281]

192. In relation to the required response to Emergencies, which is set out in section 3.6 of the Manual, the same process as that of the No. 2 Operator is followed, however, the No. 1 Operator is also required to count how many rafts are retrieved and record the down-time for the ride.[282]

193. Each of the Ride Operators, who had been trained on the ride, noted that a requirement of each of the roles was to watch the water level.[283] This was done by looking at an informal 'scum' mark around the trough of the ride, as well as the buoyancy of the rafts at the load and unload station, and whether they were sitting on the rails.

194. It seems to be the consensus amongst Ride Operators, that the TRRR was one of the most stressful rides to operate because of the difficulty and demands on the Operators, which included monitoring of the pumps, CCTV, air pressure of the gates and queue lines.[284] Generally, it appears that more experienced Ride Operators would be rostered to run the ride.[285]

Memorandums for the TRRR

195. In addition to the Operator Procedure Manual for each position of the TRRR, memorandums were issued by the Supervisory Team to inform Ride Operators of changes to procedure, draw attention to an issue that had arisen on the ride, or to clarify roles and responsibilities. It became apparent during the inquest hearing that there were no records maintained, and therefore no way to ascertain with any certainty, who had authored a particular memorandum and what the reason or purpose was for such a document to be created. According to Mr. Fyfe, who was responsible for the Supervisory Team that authored the document, each memorandum was supposed to be provided to him for final approval.[286] Unfortunately, in practice, it appears that he had no direct knowledge of who wrote each memorandum, the specific reason it was created, and whether a process of consultation between the Supervisors had been undertaken prior to a memorandum being published.[287] He would occasionally author some memorandums himself.[288]

196. According to Mr. Fyfe, memorandums were generally issued if there had been a change of ride operation, which could follow from advice provided by the E&T Department as there were equipment or mechanical changes to a ride, or from the Operations Department.[289]

197. A copy of an issued memorandum was kept with the Operating Procedure at the ride, and also where staff first attended in the morning on the memo board.[290] If it was deemed a significant memorandum (although there was no clear guideline on how this was determined) staff were required to sign off that they had read it

[281] Ex D4(103), pg. 14
[282] Ex D4(103), pg. 16
[283] Ex B3F(3), [10]
[284] T2-93, lines 7-27; T4-90, lines 6-35
[285] T4-90, lines 23-35
[286] Ex C8(6), pg. 11
[287] Ex C8(6), pg. 8
[288] Ex C8(6), pg. 8
[289] Ex C8(6), pg. 9
[290] Ex B3A(14), pg. 48; Ex C8(3), pg. 17

before they are able to operate a ride.[291]

198. The relevant memorandums that had been issued and were in effect for the TRRR at the time of the tragic incident, are detailed below.

12 February 2016

199. A 'priority urgent' memorandum was issued by the Supervisory team to all Operators and Load Operators for the TRR, titled *'TRR New buttons'.*[292] The memorandum stated that:

> *When doing your morning checks, the conveyor control panel has changed. We must now check the e-stop is out and the three switches below the e-stop are in Auto, Forward and Run.*
>
> *The Rapid Ride panel has been now fitted with a new Blue Button (conveyor reset) this is for engineering only.*
>
> *Two new sensors have been fitted at the bottom and half way up the conveyor. In the event of a raft slipping or becoming stuck at the bottom of the conveyor for more than 10 seconds, the conveyor will automatically stop and the blue 'conveyor reset' button will flash. In the event of this happening normal shut down procedure must be followed.*
>
> ***Also we have a new e-stop on the unload platform, this will stop the conveyor. Operators and load operators CAN press this ONLY in the event of an emergency, as the emergency shut down procedure must follow.***
>
> *Any further questions please see the supervisory team.*

200. In relation to the memorandum dated 12 February 2016, this was issued by the Attractions Supervisory Team as a collective document, which was primarily prepared by Ms. Crisp and Ms. Tracey McGraw.[293] This memorandum was said to have been issued following modifications made to the ride, including the installation of sensors on the conveyor and a new E-Stop at the unload area, however, the Operating Procedures were yet to be updated.[294]

201. The term 'emergency' was not defined in the document. Each of the Supervisors who provided evidence during the inquest gave somewhat different definitions of what an 'emergency' may have meant.[295] There was clearly no universally understood meaning of "emergency" that would have been easily understood by Ride Operators stationed at the TRRR.

202. The wording of this memorandum is confusing, poorly defined, unclear and at its highest, ambiguous and couched generally in negative terms. It is a significant oversight that the term 'emergency', which is highlighted in the document in connection with the use of the E-Stop, is not defined with examples provided. It

[291] Ex B3A(14), pg. 48
[292] Ex B15(18)
[293] Ex C6(46), [168] & [169]
[294] Ex C6(46), [169]; Ex C8(3), pg. 15
[295] Ex C8(3), pg. 18 & 19

is entirely reasonable and foreseeable that Ride Operators and Supervisors would have differing views as to what circumstances this direction may apply in, which became evident during the evidence provided at the inquest. This is so especially for newly trained or inexperienced Operators

29 May 2016

203. A further 'priority urgent' memorandum was issued to all Rapid Ride Operators and Load Operators by the Supervisory Team, which was titled, *Monitoring conveyor movements'*.[296] This memorandum provides that:

> *To All Thunder River Rapids Operator and Load Operators. Please ensure you are remaining vigilant when monitoring conveyor movements. This includes any obstructions that may interfere with rafts such as bent or broken brackets.*
>
> *If you identify an issue of this nature, Operators are to bring all rafts home and call for an 'Operational ASAP' via control on 325 and wait further instructions from a supervisor.*

204. According to Supervisor, Ms. Jennie Knight this memorandum was issued following a clip coming off the conveyor, which was subsequently replaced.[297] Ride Operators were requested to be mindful in case another incident occurred.

18 October 2016

205. A further 'priority urgent' memorandum, also couched in negative terms, was issued to Rapid Ride Operators and Load Operators by the Supervisory Team, which was titled, *'Unload E-Stop'.*[298] This memorandum stated:

> *All Thunder River Rapids operators and Load operators,*
>
> *The E-Stop situated at unload platform must only be pressed in the event the main control panel cannot be reached when there is potential or immediate risk either: (emphasis added)*
>
> *(i) Guest/Staff safety or well being*
> *(ii) Ride operating conditions*
> *(iii) Damage to ride equipment*
>
> *Activating this will cause the rides conveyor to stop.*

206. According to Ms. Knight, whilst she did not specifically draft this memorandum, she is aware through consultation that it was created as there was a misunderstanding amongst Ride Operators as to whether the E-Stop at the unload area stopped the conveyor and one pump or just the conveyor.[299]

[296] Ex B12(20); Ex B12(7)
[297] Ex C8(3), pg. 21
[298] Ex B12(19)
[299] Ex C8(3), pg. 22

207. It is significant that, despite being the Attractions and Entertainment Manager, whom the Supervisors answered to, Mr. Fyfe had no knowledge of the memorandums issued in relation to the TRRR, and was unable to advise who had authored the documents or the reasons each of them were issued.[300] He acknowledged during the inquest that the wording of this memorandum was ambiguous, especially for a first day Operator.[301]

208. When this memorandum is read in conjunction with sections 3.1.7 and 3.6.3 of the Operating Procedure Manual, it is clear that the direction to the No. 2 Operator is that the E-Stop is **only** to be pressed in the event that the No. 1 Operator is incapacitated, and under no other circumstances. Mr. Fyfe agreed with this interpretation during the inquest.[302] It is very clear from the Operating Procedure Manual that the No. 1 Operator is responsible for the operation of the ride, which includes the command of Code 6 situations, where they are not incapacitated.

Pre-ride Checks on the TRRR

209. Under usual conditions, when the No. 1 Operator arrived at the TRRR to open for the day, they attended the Main Control Panel to carry out the pre-start checklist.[303] This checklist required that the Operator check the following:[304]

    a. Engineering have signed the checklist signaling that they had completed the necessary checks of the ride;

    b. That 'Area Open' has signed;

    c. Check that the Rapids Alarm has been tested;

    d. That the access area is clear;

    e. Fire-Extinguisher is charged and tamper seal is in place;

    f. The First Aid kit is stocked; and

    g. That Ride Express equipment is present.

210. The Pre-Operational service sheets, which are to be completed daily by staff from the E&T Department, reflect the service checks conducted on rides.[305] Each item listed on the sheet needs to be considered and inspected by the allocated staff, and is specific to each ride. Each component of the ride to be inspected is initialed by the staff members responsible.[306] If an issue is identified with a ride during these checks, depending on the complexity, it will often be escalated to an E&T Supervisor to determine whether it needs to be fixed immediately or at a later time.[307]To ensure the service sheets are being completed, an audit is conducted by supervisors every Tuesday.[308] The TRRR requires the check of

[300] Ex C8(6), pg. 9 – 13
[301] T19-47, lines 10-20
[302] T19-48, lines 1-25
[303] Ex B3A(11), [16]
[304] Ex B3A(11), [16]
[305] Ex B3A(15), [24]
[306] Ex B3A(15), [24] & [25]
[307] Ex B3A(15), [26]
[308] Ex B3A(15), [29]

around 40-50 items each day.[309] In addition, since early 2016, there are weekly checks conducted of the sensors installed at the bottom of the conveyor.[310]

211. The Ride Operator is then required to sign the checklist to signify that the above had been completed. If there is an issue with any of these actions, an Operator is required to call a Supervisor for them to rectify the issue.[311]If the checklist is missing a signature from the E&T Department, the ride will not be opened to the public.[312]

212. As part of the start-up, the Ride Operator is also required to do the following:[313]

- Check that three switches are in the correct position, and that the Emergency Stop on the control panel is not activated.[314]
- Turn the control panel on with a key;
- Place the isolator key in the control panel;
- Press the jack reset button to activate the jacks;
- Commence the automatic-sequence start-up for the water pumps, which takes approximately 7 minutes for the South Pump to automatically start; and
- Dispatch an empty raft as a test-run before guests are allowed to board the ride.

213. At the TRRR, a folder with various documentation was maintained. From an E&T perspective, this folder contained two weeks' worth of daily checklists.[315] Down-time sheets recording when a ride has been out of operation (e.g. shutdown following a breakdown) are stapled to the back of the sheet. The down-times for each ride are subsequently entered into a computer spreadsheet by a Supervisor, with older sheets being removed each Sunday and replaced with a new sheet.[316]

214. Decisions as to when rides are closed due to operational issues or following a breakdown was a matter for E&T Department Supervisors. [317] E&T staff are the only ones permitted to restart a ride. Once they restart the ride, the Operator does not go through the start-up checklist again.[318]

Emergency Scenario Training

215. Whilst emergency response drills have previously been carried out at Dreamworld for the Buzzsaw ride and a Tiger escape,[319] no practical scenario training for emergency situations were ever implemented for the TRRR. This is

[309] Ex B3A(15), [30]
[310] Ex B3A(15), [31]
[311] Ex B3A(11), [18]
[312] Ex B3A(11), [20]
[313] Ex B3A(11), [27]
[314] Ex B3A(11), [24]
[315] Ex B3A(11), [70]
[316] Ex B3A(11), [70]
[317] Ex B3A(11), [58]
[318] Ex B3A(11), [67]
[319] Ex B3C(12), pg. 3

despite recommendations made following previous incidents that this should take place.[320]

216. It was noted by Ride Operators of the TRRR that whilst responses to emergency situations, which may arise on the ride, were outlined in the Operator Procedure Manuals, no practical scenario training was provided to equip Operators with the means to respond to various operating problems.[321]

PAST INCIDENTS ON THE TRRR

217. Documentation provided by Ardent Leisure over the course of the coronial investigation, and also produced during the inquest hearing, confirmed that there had been a number of previous incidents on the TRRR over the course of its 30 year commission. A summary of the most relevant incidents is detailed below.

18 January 2001 – H101/0019 – Property Damage[322]

218. On 18th January 2001, Ms. Melinda Lynd was rostered to perform the role of No. 1 Ride Operator on the TRRR. She commenced the start-up procedure at approximately 9:17 am, releasing all of the rafts to run a full cycle, prior to opening the ride to guests.[323] She was the only Operator present at the time. At around 9:30 am, Mr. Joe Stenning, who was rostered on as the No. 2 Operator for the TRRR that day, arrived and opened the queue line for guests. Whilst the empty rafts were travelling the water course, guests had commenced lining up. As Ms. Lynd began speaking to guests in line, two rafts became stationary at the unload area, with a further three traveling down the conveyor, having completed a full cycle of the ride.[324] This was noticed by both Ms. Lynd and Mr. Stenning, however, no attempt was made by Ms. Lynd to release the stranded rafts. As the three additional rafts came off the conveyor, they collided with the stationary rafts, causing one to flip. Having seen the rafts flip, an operational Code 6 was called, at which time Ms. Lynd called 222 and tried to describe the incident, which was not clear. She then hit the emergency jack button and stopped the conveyor.[325] The rafts were unable to be freed. Senior Attractions staff arrived at the TRRR shortly thereafter, and guests were cleared from the area. The following photographs of the aftermath of the incident depict the scene.

2001 INCIDENT - Ex. B10(1)

[320] Ex B3A(3), pg. 13; Ex B3A(12), pg. 30
[321] T4-56, lines 15-30
[322] Ex B10(2)
[323] Ex B10(2), pg. 1
[324] Ex B10(2), pg. 1
[325] Ex B10(2), pg. 1

219. Ms. Lynd commenced employment with Dreamworld in the late 1990s, and had been a Ride Operator for around five years prior to the incident.[326] She recalls being trained as an Assistant Operator on the TRRR on her first day working at Dreamworld. It was a few years before she was trained as the No. 1 Operator.[327]

220. In relation to the incident, Ms. Lynd recalls in her statement that she was very upset by what had happened, and did not believe there was anything that she could have done to prevent it from occurring.[328]

221. Mr. Stenning had been working at Dreamworld since 1999 as an Attractions staff member, which included the operation of some of the simpler rides.[329] He recalls being trained as a Deckhand and at the unload station of the TRRR, however, never manned the control panel or was taught to shut down the ride.[330]

222. Mr. Stenning recalls that following the incident, he was taken away from the area separately to Ms. Lynd, and was not able to speak about the incident whilst the investigation was pending.[331] He believes that he may have participated in a debrief discussion following the event.[332]

Incident Report

223. An investigation into the cause of the incident was conducted and a report compiled ('the Report'). It was found that, '*the push of the conveyor caused a compaction effect, resulting in the rafts being caught at the unload area and one raft flipping*. *It is then believed that the unload button may have been depressed releasing a raft, but the second raft with the push of the additional rafts behind had got caught on the edge of the platform'.*[333]

224. The incident was identified as a 'dangerous event', following which OIR were called. Having explained the sequence of events verbally, it was determined that no formal notification was required. The Report notes that '*the response team including TBS, RB, BT, SH & AN identified the incident as a dangerous event and at 10:08 am AN contacted the Workplace Health & Safety – South Coast Division and was put through the Dave Mazzer, District Manager Workplace Health & Safety (Southport). The sequence of events was explained by mobile phone. Dave responded that he was confident with DW's own internal investigation process and requested that a file be kept that a courtesy call was made to the Division. No formal notification was required.'*[334]

225. The contributing factors with respect to the actions of the Operator, were found to be as follows:[335]

- Distraction from guests – attention was diverted from operating ride.
- Second employee stuck – there should have been two Operators start the ride at 9:15 am.

[326] Ex B3F(1), [2]
[327] Ex B3F(1), [6] & [7]
[328] Ex B3F(1), [11]
[329] Ex B3F(3), [2]
[330] T9-6, lines 15-47
[331] Ex B3F(3), [18] & [19]
[332] T9-13, lines 38-40
[333] Ex B10(2), pg. 1
[334] Ex B10(2), pg. 2
[335] Ex B(10)(2), pg. 2

- Employee panicking – Operator responded inappropriately. Lack of confidence to make own decision in an emergency situation (when it was noted that she is the more Senior Operator).

- Communication – employee did not relay details of events satisfactorily to Control or Supervisors.

226. The final outcome of the incident was determined to be that there had had been a failure to adhere to the start-up procedure, and the Operator had not followed the correct emergency response procedure.[336] As part of the investigation into the incident, the Report notes that a review of the operational procedures of the TRRR was conducted, and that the possibility of the same event occurring whilst guests were on the rafts was held to be 'nil'.[337] This conclusion was based on the following reasoning (assuming the correct operating procedures were being followed):[338]

    - There would have been two people operating the ride;

    - No loaded rafts are to be dispatched without the second Operator being present, which would eliminate the rafts banking up at the unload area. The Deckhand has control of the unload of guests and the flow of rafts through to the unload area;

    - The dispatch time between the rafts would have been greater, giving the Deckhand and No. 1 Operator more time to react to the situation; and

    - The Deckhand would have seen the situation as it was evolving and been able to react in a more timely fashion and/or followed correct emergency procedures.

227. A review of the training procedures for the TRRR and Ms. Lynd's records were also undertaken as part of the investigation. It was noted in the Report that she had been trained by Mr. David Wilkinson, a Relief Supervisor (who was an accredited trainer, and staff member for 12 years), and subsequently audited by Mr. Garren Cox, who was an Attractions Supervisor and Training Coordinator.[339]

228. It was further acknowledged that there had been a breakdown in the communication process and notification by way of the two-way broadcast. That was because the incident was not called in as a 'Code 222-Grey' but rather dubbed 'operational'.

229. During the inquest, Mr. Stenning stated that he was not made aware of the findings of the investigation report following the incident.[340]

[336] Ex B10(2), pg.2
[337] Ex B10(2), pg.2
[338] Ex B10(2), pg.2
[339] Ex B10(2), pg.2
[340] T9-16, lines 10-15

Recommendations

230. The following recommendations were made following this incident:[341]

- Emergency Response Scenario Training for all Ride Operators in the various Code 222's in order to improve confidence when involved in an emergency situation.

- Communication – a review of determining notification of broadcast from Code 222 phone calls.

- Human Resources to be involved in disciplinary action in regard to incorrect operation of ride.

- Amend procedure so that both Operator and the deckhand should be present to start ride (opening and operating procedures) on all occasions.

231. Following the incident, Ms. Lynd was moved into a position working in the Food and Beverage division of Dreamworld, however, resigned shortly thereafter.[342]

Comments About the Incident

232. From the extensive documentary exhibits provided by Ardent Leisure, and the evidence given during the course of the inquest, it does not appear that the investigation into this particular incident extended to consider the design of the ride, although subsequent modifications were made to the unload platform.

233. I am satisfied that a thorough engineering hazard or risk assessment of the ride was not conducted as a result of this incident. Engineering staff, who were employed at the time, were not consulted as to whether any modifications needed to be made to the ride to ensure a similar incident did not reoccur.

234. Despite the recommendations of this incident, no practice scenario-based training for emergency situations was ever provided for the TRRR, or any other ride at Dreamworld prior to the subject tragedy. It is unknown why this recommendation was never implemented. A thorough review of this incident would have presented a timely and graphic reminder to all safety staff as to what, potentially, could have occurred once a raft blocked the passage of following rafts coming down the conveyor. It is fortunate there were no passengers in the rafts at the time.

7 October 2004[343]

235. At around 3:05 pm on 7 October 2004, a raft on the TRRR entered the unload station and patrons started to disembark. As the final passenger was leaving the raft with the assistance of an Operator, another raft entered the unloading dock and made contact with the stationary raft. The passenger lost her balance and fell into the water, passing under the raft. A fellow passenger and the Ride Operator entered the water to provide assistance and retrieve the guest. No injuries aside from subsequent neck pain were sustained by the passenger.[344]

[341] Ex B(10)(2), pg. 3
[342] Ex B3F (1), [12]
[343] Ex B10(3)
[344] Ex B10(3), pg. 2 & 3

236. OIR were notified of the incident via telephone on 7 October 2004.[345] No statutory notices were issued under the condition that the incident was internally investigated by Dreamworld, and engineering controls to prevent the incident from re-occurring were considered.[346]

237. It appears that the incident was investigated by Dreamworld, with a report subsequently prepared.[347] The contributing factors to the incident were identified as follows:

- *Raft spacing* – during normal ride operation, the rafts are released from the loading dock at uniform intervals, which is designed to prevent contact between the rafts allowing patrons sufficient time to disembark. However, extra time taken for passengers to disembark from a raft or a difference in the speed at which the rafts travel, can cause the rafts to 'queue up' and make contact at the unloading area.[348]

- *Engineering control* – the Report noted that *'at the time of the incident, administrative procedures and engineering controls were employed to prevent rafts contacting. However, the ride could be improved by implementing further engineering controls…'*[349]

- *Operational factors* – the efficiency and time required to disembark passengers from the raft at the end of the ride is related to the experience of the Operator. Video footage of the incident suggests that the Ride Operator assisting guests to disembark, who was relatively new, may have 'struggled' to be meeting the unloading demands.[350]

238. A number of short-term and long-term **corrective actions** were identified to '*more adequately control the risk of raft collision'*.[351] These actions included:

- *Installation of emergency stops:* It was noted that an additional emergency stop button had been installed in the un-loading dock, which shuts down one of the two main pumps circulating water through the ride. Further investigation was to be '*directed towards 'double pump' E stopping', which was intended to immediately shut down both pumps to 'rapidly dissipate the water*'.[352]

- *Fewer rafts circulating the ride:* It was noted in the Report that a '*timer permitted dispatch is scheduled for installation by late 2004'*, which would release rafts at the loading dock at predetermined intervals.[353] Following the incident, the rafts used in circulation for the ride was decreased from 12 to eight. A standing order was then put in place, which limited the maximum number of rafts in circulation to eight. It was noted that '*This will remain current until the completion of improvements to the ride and further assessments indicate a higher number can be safely operated'.*[354]

[345] Ex B10(3), pg. 3
[346] Ex B10(3), pg. 3
[347] Ex B10(3)
[348] Ex B10(3), pg. 3
[349] Ex B10(3), pg. 3
[350] Ex B10(3), pg. 3
[351] Ex B10(3), pg. 4
[352] Ex B10(3), pg. 4
[353] Ex B10(3), pg. 4
[354] Ex B10(3), pg. 4

- *Additional raft hold gate:* A further holding gate was to be positioned before the unloading dock, to ensure that a raft approaching the unload area would not make contact with another raft. This gate was subsequently installed at some time before 21 October 2004.[355]

- *Conveyor speed controller:* The Report noted that *'some investigation has already been undertaken into the possible installation of a conveyor belt speed controller. This controller (operated by the unload attendant) would lower the speed of the conveyor belt should rafts begin to queue in the unload dock. At this time, the speed controller is not considered necessary. However if collision potential is still unsatisfactory following installation of the timer and holding gate, further investigation into the speed controller will take place.'*[356]

- *Power assisted raft positioners:* the Report stated that *'the process of correctly positioning the raft in the unloading dock is planned to be automated via the use of a mechanical raft positioner. The positioner will no longer require the operator to manually manoevre the raft with their arms and legs.'*[357] The intention of this corrective action was to reduce the Operator's 'manual task exposure'. According to the Report, this system was in the 'design stage' and intended to be installed during major refurbishments of the ride in 2005.

239. In addition, operational issues were identified following the incident. Whilst the Report noted that '*all staff required to operate the Rapids Ride undertake comprehensive training in all facets of the ride's operation and emergency procedures',* a number of changes were subsequently made to the training regime.[358] These changes included, refresher training to be provided to Operators, an update of the procedures manual, as well as the expansion of the auditing checklists to include an assessment of the rafts queuing in the unload dock.[359] It was intended, according to the Report, for the operating procedures manual to be updated to include the engineering controls once installed.

240. It was also recommended, following the investigation into this incident, that Senior Ride Operators may be required to monitor the ability of the unload attendant to 'cope' with the unloading demands, so that those who were thought to be struggling could be provided with additional training and mentoring.[360]

241. The Report acknowledged that at the time of the incident, administrative controls were the primary means of avoiding raft collision at the unload area. The corrective actions suggested were intended to more adequately control the risk of future raft collisions.[361]

Further Consideration and Implementation of the Recommendations by Dreamworld

242. Following the incident, consideration was given to increasing the number of rafts in circulation at the TRRR from 10 to 11 with a three person operation.[362] The purpose and findings of the investigation were detailed in a Report ('the Report').

[355] Ex B10(3), pg. 6, See Appendix 2
[356] Ex B10(3), pg. 4
[357] Ex B10(3), pg. 5
[358] Ex B10(3), pg. 5
[359] Ex B10(3), pg. 5
[360] Ex B10(3), pg. 5
[361] Ex B10(3), pg. 5
[362] Ex C4(5), pg. 541

The Report was intended to exclude the model where only two Operators were present, as a maximum of nine rafts would continue to be used.

243. Since the incident in October, an additional holding gate had been installed at the unload area, as well as an automated timer for the dispatch of rafts to ensure they were dispatched with a minimum time lag of 30 seconds.[363] The Report noted that *'the combination of these controls ensures that the rafts are sufficiently separated and at no time can a raft being unloaded ever be contacted by a following raft.'*[364] Following the implementation of these engineering controls, the number of rafts in operation was increased to nine for two Operators and 10 for three.

244. The intention of having an extra raft in use was to ensure there was an additional raft available at the load area to minimise the time guests have to wait to load a raft, which was thought to positively increase capacity.[365]

245. An assessment was conducted of the further increase in the number of rafts. As detailed in the Report, it was found that:[366]

- A complete circuit of the TRRR from the timed release gate to the holding gate was around 245 seconds. Therefore, if a raft is released by the timed gate every 30 seconds, the maximum number of rafts that can be in circuit between the timed gate and the first unload gate is nine.

- Due to the number of rafts that would be operational, it would require efficient running of the ride, in order to prevent an accumulation of rafts at the load area.

- If an accumulation of rafts was to occur, four could be in place between the load and unload dock before any issue arose.

246. The limitations of the assessment as to the increase in the number of rafts was stated in the Report to be that it was based on sighting eight rafts in operation with both two and three Operators. It was recommended that a trial of 11 rafts should be undertaken before final approval was made.[367]

247. Ultimately, the final recommendations made were:[368]

- To mitigate risk, only experienced staff should operate the TRRR when 11 rafts are in operation.

- Trials should be undertaken outside of standard operating hours to ensure no other risks are identified and to ensure timings are accurate.

- Implementation should be monitored and reviewed to ensure the operation of 11 rafts is sustainable.

- Two rafts must be taken out of circuit and stored appropriately in the holding area if the operation of the attraction is reduced to two Operators.

[363] Ex C4(5), pg. 541
[364] Ex C4(5), pg. 541
[365] Ex C4(5), pg. 541
[366] Ex C4(5), pg. 541
[367] Ex C4(5), pg. 541
[368] Ex C4(5), pg. 541 & 542

Comments about the Incident

248. It is unclear from the Report, further documentary material and the evidence provided during the inquest, as to whether any Engineering input was sought for the purpose of the investigation and/or Report. On balance, it appears that those in the E&T Department did not consider the risks associated with the ride following this incident.

249. It is clear given the configuration of the TRRR at the time of the tragic incident in 2016, not all of the recommendations, particularly the further engineering controls, had been implemented. It is unclear based on the records available as to why this course was taken.

28 August 2005

250. On 28 August 2005, the Unload Ride Operator observed an extended gap between the rafts arriving at the unload dock. He observed on the conveyor that three rafts were traveling on the belt together. The Ride Load Operator immediately closed the emergency jack to prevent further rafts from being dispatched, and all guests were returned and able to disembark safely.[369]

251. Supervisors from the Engineering and Operations Departments were called to attend the incident. It was found that the first raft had taken on water, and was removed from circulation. This may have contributed to the incident by making it more difficult for the raft to transition onto the conveyor belt and a lower stance when on the water.[370]

252. The investigation Report ('the Report') prepared following the incident noted that there were limitations to the coverage provided by the current CCTV monitoring system at the TRRR, which was only a single camera located beneath the Mine Ride. The Report noted that, *'this location may be inappropriate and thus compromise the ability of the load operator monitor the belt effectively'.*[371]

253. The following recommendations and corrective actions were undertaken as a result of the incident:

(iv) Short-term

- Extensive testing was carried out to determine the cause of the water leak in the initial raft. A more comprehensive system for dewatering the rafts was subsequently developed, which was to occur four times a week (rather than three). Records of this dewatering activity were also introduced.[372]

- In order to assist Ride Operators to monitor the conveyor belt, consideration was to be given to a second CCTV screen positioned at the unload station. The intention of the screen was to '*solely display the conveyor belt and enable the unload operator to monitor raft spacing more effectively and consistently. Furthermore, this would also be*

[369] Ex B10(4), pg. 1
[370] Ex B10(4), pg. 1
[371] Ex B10(4), pg. 1
[372] Ex B10(4), pg. 1

*advantageous to the load operator, who must perform numerous tasks simultaneously – **many of which are cognitively draining**.'*[373]

- A warning was also issued to all Attractions Supervisors and TRRR Ride Operators, which emphasised the need for Operators to monitor raft gaps and CCTV coverage of the conveyor belt prior to dispatching rafts. Operators were also advised that the Load Operator's screen had been re-configured to '*enlarge the view of the conveyor belt camera. This will enable more effective monitoring of raft transition onto the conveyor belt'.*[374]

(v) Long-term

- It was noted that the TRRR's safety would also benefit from Attractions Supervisors continuing to carry out visual assessments of the Ride Operators, in particular, focusing on the required periodic checks.[375]

- Raft floatation indicators were also being investigated by the Engineering Department in order to '*assist operators in identifying possible water infiltration during operation'.*[376]

26 February 2008

254. On 26 February 2008 at around 11:10 am, Ride Operators experienced issues with the raft dispatch sensor, which prevented rafts from being dispatched consistently.[377] A Supervisor was contacted and advised of the problem. An E&T employee attended the TRRR and repaired the sensor. By this time, three rafts had banked up at the dispatch area and were resting on the emergency jack. Whilst three empty rafts were cleared by being released, there was concern that there may have been inadequate spacing. A further four rafts were released, one with patrons on board. Two of the rafts initially dispatched became jammed at the jungle section of the TRRR, which caused the other four rafts to stop, including the one containing guests. The emergency procedure was activated and the guests were evacuated without incident.

255. Following an investigation of the incident, the factors found to have contributed were:

- *Breach of operational procedure:* the Investigation Report ('the Report') noted that whilst the operating procedures for the TRRR are 'clear and un-ambiguous', there was a clear breach of the requirement to monitor rafts via the CCTV and to heed the spacing stipulations.[378] The breach of the procedure was considered to be the major contributing factor towards the incident. The Operator admitted to being aware of the procedure and the safety implications of having rafts dispatched at incorrect intervals, saying that '*rafts could jam or flip under these circumstances'.*[379]

[373] Ex B10(4), pg. 1
[374] Ex B10(4), pg. 2
[375] Ex B10(4), pg. 2
[376] Ex B10(4), pg. 2
[377] Ex B15(17), pg. 2
[378] Ex B15(17), pg. 2
[379] Ex B15(17), pg. 3

- *Release of rafts procedure:* Whilst not considered to be a major contributing factor towards the incident, the release by the engineer of the rafts banked up at the emergency jack without appropriate spacing intervals due to the technical nature of the jack, was identified as an issue, which could be further investigated.[380]

- *Ride control status during Code 6:* Whilst not found to be a major contributing factor to the incident, the 'change-over' of control of the ride between Engineering and Attractions staff was identified as a potential issue.[381]

256. Ultimately, the following recommendations were made:

- *Engineering:* Investigate whether the electrical/mechanical systems controlling the emergency jack can be modified so as to release one raft at a time.[382]

- *Procedural:* Further definition to be provided as to when Ride Operators hand over control of the ride to engineering staff, and vice-versa.[383]

6 November 2014 – 'The BUSS Incident'

257. On 6 November 2014 at around 12:30 pm, Mr. Stephen Buss was the No. 1 Ride Operator at the TRRR. He claims that he heard the backup compressor shut down, without the sounding of a low air alarm.[384] Around 10 minutes later, he claims that a low air alarm sounded and he stopped the dispatching of rafts, before roping and securing the 1st raft. The water level was observed to drop following the sounding of the alarm.[385] Mr. Buss subsequently retrieved six of the nine rafts in circulation. He admitted that he had mistakenly turned a single pump off during the incident. Due to the lower water level, a raft had stopped at the unload area shortly off the end of the conveyor and was stuck on the rails, with another approaching on the conveyor. Upon noticing this, Mr. Buss claims that he turned the conveyor off to avoid a collision.[386] Video footage of the incident, however, shows that the conveyor was only stopped after the rafts came into contact with one another with the tubes bumping as the conveyor continued to move.[387] This accords with the No. 2 Operator's recollection of the incident.[388] Mr. Buss then manually restarted the pump he had turned off, retrieving the 7th and 8th rafts. He was notified by the gift stop that the 9th raft had drifted in to the reservoir, at which time he commenced a Code 6. Accounts suggest this occurred at around 12:32 pm.[389] When Mr. Buss observed the 9th raft at the bottom of the conveyor, he decided to restart the ride in an attempt to retrieve the raft.

[380] Ex B15(17), pg. 3
[381] Ex B15(17), pg. 3
[382] Ex B15(17), pg. 3
[383] Ex B15(17), pg. 3
[384] Ex C8(21), pg. 67
[385] Ex C8(21), pg. 81
[386] Ex C8(21), pg. 67
[387] Ex C8(15), see RAPIDS06111402, at 03:08:32 onwards
[388] Ex C8(21), pg. 81
[389] Ex C8(21), pg. 75

258. Supervisors and E&T staff arrived at the TRRR shortly after the Code 6 was called in relation to the incident. Mr. Buss, however, continued to operate the TRRR for the remaining part of that day.[390]

259. An investigation into the incident, which was deemed a 'serious breach of safety', was subsequently commenced.[391] In addition to viewing CCTV footage of the incident, staff were interviewed and a number of meetings were held with Mr. Buss.[392] It was alleged that he had failed to follow the correct procedure for a 'Loss of Air Pressure Alarm (Low Air Alarm)' at the TRRR, and had subsequently restarted equipment without authorisation or direction, which had resulted in creating a significant risk to guest safety.[393]

260. Ultimately, Dreamworld found the following in relation to the incident:[394]

- Surveillance footage confirmed that Mr. Buss did not follow the correct procedure for a 'Low Air Alarm', and had shut down a pump at the TRRR without verifying the location of all rafts in operation in the ride circuit. This led to a situation where a raft containing patrons 'bottomed out' at the top of the conveyor due to a lack of water supply, and an additional raft containing guests has then collided with it. This raft continued to be pushed by the conveyor until the conveyor was shut down. In shutting down the pump, footage confirmed that this resulted in a change of direction for the water at the bottom of the conveyor, which forced a raft with guests on board into the reservoir, where they floated unattended for a period of more than two minutes.[395]

- Mr. Buss confirmed that he had manually restarted the pump he had shut down, which was not in line with the procedure for a 'Loss of Air Pressure Alarm' or the 'Operator Initiate Shut Down' procedures. This action was completed without authorisation or direction, and created a significant risk to guest safety.[396]

- After freeing the two rafts at the top of the conveyor by manually restarting the shut-down pump, the No. 2 Operator advised Mr. Buss that there were guests stuck at the entrance of the reservoir. At this time, he escalated the incident from an 'Operational' to a 'Code 6', however, did not follow the procedure to initiate an Operator Shut Down as per the operating procedure of the TRRR. He also did not raise the 'Rapid Ride Alarm'. Instead, Mr. Buss restarted the conveyor to capture another raft that was visible in his monitor at the bottom of the conveyor. He then called off the 'Code 6' claiming that all the rafts had been homed. It was noted that, *'This raft, left sitting at the bottom of the conveyor was at serious risk of flipping due to the increased pressure from the re-started pump'.*[397]

261. Mr. Buss' conduct was held to constitute a serious breach of safety and the

[390] T12-98, lines 1-15
[391] Ex C8(21), pg. 53
[392] Ex C8(21), pg. 53 onwards
[393] Ex C8(21), pg. 53
[394] Ex C8(21), pg. 53
[395] Ex C8(21), pg. 53
[396] Ex C8(21), pg. 53
[397] Ex C8(21), pg. 55

Dreamworld Code of Conduct, '*Expectations of all Team Members'*.[398] He was asked to show cause as to why his employment should not be ceased due to his conduct and concerns in relation to his ability to operate rides in a safe manner. He failed to do so and was terminated.

262. Mr. Buss was first employed with Dreamworld in 2006. At the time of the incident, he was an experienced Level 3 (No. 1) Operator for all of the rides at the Theme Park.[399] From the various records provided, it appears that Mr. Buss was first trained as a Ride Operator on the TRRR in April 2008.[400] During the inquest, he claimed that he had been rostered on to operate the TRRR around once a week and was very familiar with the ride.[401] He had also previously been involved in Code 6s at the TRRR with various causes, including a pump failure and low pressure alarm.[402] Mr. Buss, despite being one of the most senior Ride Operators at the park at the time, was not offered any retraining prior to his dismissal.[403]

263. Despite his extensive experience, Mr. Buss described the operation of the TRRR as more difficult than other rides as there were a lot of tasks to undertake simultaneously.[404]

264. It does not appear that following Mr. Buss' termination, his actions from a safety perspective were discussed or redressed by way of training with other Ride Operators.[405]

13 November 2014 - Bob Tan Email to Leadership Team

265. On 13 November 2014, following the incident involving Mr. Buss, Mr. Bob Tan, General Manager of Special Projects, sent an email to the Dreamworld Leadership Team titled, *'Re: Ride incidents of relevance'.*[406] The email highlights some 'peak relevant incidents' on similar rides, following a discussion at the meeting that day concerning breaches/deviations in procedures.

266. The first incident occurred in Texas in 2013, when a woman fell from a Giant roller coaster. It was thought that she may have been of too large a size to be secured by the restraint bar. Mr. Tan noted that, *'Actual cause still unconfirmed, but an innocent guest dies because a safety process was deficient…'*[407]

267. The second incident highlighted the incident involving Ms. Lynd in 2001, with pictures of the flipped rafts attached. Mr. Tan noted, *'This occurred on the rapid ride several years ago, and fortunately there was no injury except for property damage.* ***I shudder when I think if there had been guests on the rafts****…'*[408]

268. The Head of the Engineering Department, Mr. Christopher Deaves, responded to Mr. Tan's email inquiring as to how the incident on the TRRR had occurred, as he had never 'seen or heard' of the event.[409] Mr. Tan responded stating, *'scary*

[398] Ex C8(21), pg. 55
[399] Ex F2B(1)(a), pg. 3 & 4
[400] Ex C8(21), pg. 589-605
[401] T12-81, lines 35-45
[402] Ex F2B(1)(a), pg. 25
[403] Ex F2B(1)(a), pg. 35; T12-94, lines 10-20
[404] T12-84, lines 30-47
[405] T5-8, lines 35-45
[406] Ex C8(26)(c), pg. 1
[407] Ex C8(26)(c), pg. 1
[408] Ex C8(26)(c), pg. 1
[409] Ex C8(26)(c), pg. 4

photos huh?'[410] He also noted, *'Allowing rafts to bank up against a raft at unload dock'.*[411]

269. Mr. Deaves subsequently asked whether the risks highlighted (presumably from the Texas incident) were ongoing from seat belts being undone on rides.[412] In response, Mr. Tan relevantly stated that, *'No, 2 senior long service operators/instructors breeching procedures: Rapid Ride – Shut off a pump/restarted again. Also stopped conveyor, all against procedure...'*[413]

Further Incidents Recorded in Log Reports

270. A number of other less significant incidents and issues, which occurred on the TRRR, were identified in Log Reports provided as part of the documentary material supplied by Ardent Leisure.

271. A summary of some of the more pertinent incidents and issues are as follows:

- *27 June 2010:* A power dip caused the South Pump at the ride to shut down. The alarm was sounded by the Operators. Two rafts floated into the reservoir where they were retrieved by engineering staff. A third raft stalled between the conveyor and the unload station, and guests were unable to be safely unloaded until both pumps could be restarted.[414]

- *30 June 2010:* Report that a guest fell into the water whilst helping another guest out of the raft. Other rafts have pushed through the stopping jack and contacted stationary raft. Guest landed between the metal guard rails. Operations and Attractions in attendance.[415]

- *16 September 2011:* Reported that guest was on the ride when the raft was climbing the conveyor and has slipped down and contacted another raft at the bottom of the conveyor.[416]

- *13 October 2012:* An incident occurred when three rafts jammed together in the trough next to the sand filter. The trough was inspected and the water level was checked, and it appeared to be an issue with the dispatch of the rafts.[417]

- *23 December 2013:* Staff member was working at the unload dock of the ride, when they slipped and fell into the water on the up current side of the raft. Employee had started to be dragged under the raft, and was grabbed by the guest. Rapids ride alarm was hit and the ride stopped.[418]

- *29 February 2016:* The alarm was set off when the conveyor ceased to work. There were approximately five rafts stopped at the bottom of the conveyor. Engineers, attractions supervisors, first aid and security attended the incident. There were no reported injuries as a result.

[410] Ex C8(26)(c), pg. 12
[411] Ex C8(26)(c), pg. 14
[412] Ex C8(26)(c), pg. 10
[413] Ex C8(26)(c), pg. 10
[414] Ex E(369)
[415] Ex E(511)
[416] Ex E(508); Ex E(514)
[417] Ex E(281); E(350)
[418] Ex E(550)

Approximately 28 guests were involved.[419]

- *15 June 2016:* Under "issues" on the Engineering Supervisors Sheet, it was noted that the Rapid Ride South Pump had a bearing failure and there was monitoring of southern pump temperatures.[420]

- *22 June 2016:* The TRRR was under service from 10 am until 11:30 am due to issues with the South Pump Flange (Code 237).[421]

DREAMWORLD SAFETY DEPARTMENT

272. The purpose of the Dreamworld Safety Department was to assist with safety compliance and continually improve culture/business practice in conjunction with other Departments.[422] At the time of the tragic incident, the team consisted of four Safety Officers, two of whom were experienced paramedics, Mr. John Clark and Ms. Allyson Sutcliffe, a First Aid Officer, Mr. Benjamin Hicks and Ms. Rebecca Ramsey, a Registered Nurse.[423] Ms. Ramsey describes her responsibilities on a daily basis as checking the risk management system, Figtree to see what incidents had occurred around the park in order to determine what further investigations needed to be undertaken, which included risk assessments.[424]

273. Mr. Mark Thompson was the Safety Manager (Dreamworld), and Mr. Angus Hutchings was the Group Safety Manager for Ardent Leisure. Mr. Hutchings and Mr. Davidson were responsible for ensuring that Senior Committee and Board of Director members were kept abreast of safety related issues at Dreamworld.[425]

274. Mr. Hutchings, as the Group Safety Manager for Ardent Leisure, had a number of broad responsibilities across various businesses, which included Dreamworld. He was required to provide support and assistance to Ardent Safety Managers as to a range of safety and risk issues at strategic and operational levels, as well as monitor group wide OHS performance and coordinate various audits, inspections and safety initiatives throughout the group. [426]

275. As the Safety Manager, Mr. Thompson describes his role as 'one of consultancy and advisory response' whereby he did not have decision making powers.[427] His responsibilities included the following:[428]

    - Deliver training on general safety matters at induction, including basic hazard identification information;[429]

    - Deliver training on park-wide matters such as lock-out, tag out procedures or chemical training;

    - Respond to management or employee issues that were raised through

[419] Ex E(369)
[420] Ex E(57)
[421] Ex E(49)
[422] Ex C6(51), [40]
[423] Ex C5(23)(c), pg. 5
[424] Ex C5(23)(c), pg. 5
[425] Ex C6(51), [58] & [60]
[426] Ex C8(23)(a)
[427] Ex C6(51), [28]
[428] Ex C6(51), [3]
[429] T6-15, lines 40-48

the Figtree system and implement control measures for hazards through the process;

- Attend meetings of Senior Leadership Team, the Safety Executive, Park Operations Meetings and Engineers Supervisors;
- Investigate workers compensation claims;
- Investigate suspected safety breaches or operating procedures for Human Resources or the relevant Departments;
- Order PPE;
- Oversee management of the First Aid Clinic; and
- Preparation of various reports.

276. Mr. Thompson did not conduct regular safety audits or inspections at Dreamworld.[430] He states that he thought these were organised by Mr. Hutchings with external auditors or carried out by Health and Safety Representatives (also known as safety ambassadors).[431] Whilst Mr. Thompson did not conduct any holistic risk assessments of rides having the view that the E&T Department were responsible for such matters, he did note during the inquest that individual components of rides were assessed from time to time, such as the cleanliness of the water in use for the cannons located on the walkway near the TRRR.[432] There were no safety audits conducted, according to Mr. Thompson, as to the human components of the ride systems at Dreamworld.[433]

277. It is significant to note that Mr. Thompson, as the Safety Manager of Dreamworld, was not aware of the recommendations made by any external auditors commissioned by Dreamworld to conduct assessments in relation to safety of the rides and attractions, and did not have a copy of the reports commissioned.[434] Decisions as to the implementation of external auditor recommendations were made by Mr. Hutchings, Mr. Deaves and Mr. Tan before his departure.[435]

278. According to Mr. Thompson, the Safety Team at Dreamworld was not structured to operate effectively.[436] He describes his role as having a large amount of responsibility, which made it difficult for him to complete the reactive work required, let alone any proactive safety management.[437] He notes that on a daily basis, members of the Safety Team would be 'pulled away' to conduct ride assessments for guests arriving at the Park or other tasks, which left the group short staffed. This meant Mr. Thompson was personally required to compensate and carry out the tasks of his delegates.[438] This was an ongoing issue he claims he raised directly with Mr. Hutchings.[439] Furthermore, the members of the Safety Team were primarily first aid officers, rather than experienced safety officers.[440]

[430] Ex C6(51), [13]
[431] Ex C6(51), [13]; T6-20, lines 34-45
[432] Ex C6(51), [14]; T6-21, lines 25-45
[433] T6-22, lines 30-50
[434] Ex C6(51), [51] – [53]
[435] Ex C6(51), [16]
[436] Ex C6(51), [71]
[437] T6-24, lines 24-35; T6-37, lines 1-10
[438] T6-24, lines 25-48
[439] T6-24, lines 35-45
[440] T6-24, lines 40-48

Mr. Thompson described the safety systems in place at Dreamworld at the time of his commencement as '*quite immature*'.[441]

279. In terms of issues associated with rides or operating procedures, Mr. Thompson stated during the inquest that whilst he would have assisted had any issues been raised with him, he does not recall this ever taking place in relation to the TRRR.[442]

Figtree Reporting System

280. Figtree is an electronic database that was utilised by Dreamworld at the time of the tragic incident to record any injuries, hazards or incidents that occurred throughout the Theme Park.[443] Corrective action taken was then noted in the system.[444] Mr. Thompson described the system as 'reactive management'.[445]

281. During the inquest, Mr. Hutchings stated that he wanted to introduce a risk register across the business, which would record all of the risks within each department, the perceived level of risk and also ways to control and reduce the risk.[446] He stated that he received some '*pushback*' for this idea.[447] Mr. Hutchings noted that at the time, the document control systems in place at Dreamworld were 'quite poor', and he was concerned that there may have been a range of risk management activities occurring, which weren't being recorded in any kind of formal register.[448] He was advised over a number of years that the funding wasn't available for such a register.[449]In 2009, a new risk management system was introduced to Dreamworld, however, Mr. Hutchings noted that the system was not used as widely as he would have hoped as it was not sufficiently user friendly.[450]

282. Mr. Hutchings acknowledged that within Dreamworld there was segmentation of knowledge between the Departments, which caused him concern as there was a perception and tendency that issues within Dreamworld were someone else's responsibility.[451] This tendency was not deliberate, but rather a misunderstanding as to each Department's responsibility.[452]

TRRR Risk Assessments

283. From the sparse and haphazard records provided by Ardent Leisure, it appears that various 'risk assessments' were conducted on different aspects of the rides by members of the Safety, Operations and Attractions Departments.[453] The template documents used for these assessments had a risk matrix, which were pre-designed and broadly applied for all of the investigations conducted.[454] The catalyst for such assessments seem to be issues raised by Ride Operators or

[441] T6-35, 36, lines 1-11
[442] T6-27, lines 17-40
[443] Ex C5(23)(c), pg. 6
[444] Ex B3C(50), pg. 13
[445] T6-16, lines 28
[446] T21-16, lines 40-47
[447] T21-16, lines 35-47
[448] T21-17, lines 25-40
[449] T21-17, lines 32-40
[450] T21-18, lines 1-40
[451] T21-33, lines 23-50; T21-34, lines 1-5
[452] T21-34, lines 9-18
[453] Ex C8(3), pg. 5 & 6
[454] Ex C5(23)(c), pg. 19; Ex C5(23)(d)

other staff about corrective actions or work that needed to be undertaken.[455]

284. Whilst the scope of these risk assessments varied somewhat, it is clear from the material provided that a documented engineering risk assessment of the ride, adequately considering the hazards posed by different components or the ride as a whole, was never conducted. This is particularly troubling having regard to the previous incidents already documented.

285. Based upon the documentation, a summary of the 'risk assessments' conducted on the TRRR is outlined below. Given the limited and poor record keeping and databases maintained in relation to such assessments, it is not possible to determine if any further undocumented assessments were conducted, and what changes if any were subsequently made.

286. On 9 July 2015, Mr. Deaves, Mr. Alex Navarro, Mr. Shane Green and Ms. Anneke Triebels conducted a 'risk assessment' of various aspects of the TRRR, including breakage of the conveyor chain and the depth of the watercourse.[456] It is not clear what the catalyst was for this risk assessment. Ms. Horton does recall two instances were rafts had slid down the conveyor, whilst on the mechanism.[457]

287. The issues considered and findings reached in the Risk Assessment Form are as follows:

Task/Topic/Issue	**Description of Hazard**	**Description of potential hazard**	**Current control measure**	**L**	**C**	**R**	**Comment**
Components on the conveyor chain have been identified as posing a risk of breakage due to thinning of metal components	Conveyor chain breakage	Chain breakage will lead to an derailing of conveyor, potentially causing: - Rafts potential to slide backwards/colliding creating a backlog - High potential for debris (chain components as well as timber palings) to congest conveyor area as well as pump components - Potential for raft to flip	Alarm/Code 6 activation	1 3 1 1	4 4 4 4	4 12 4 4	Suggested control mechanism: Sensor mechanism fitted toward the bottom of the conveyor will identify breakage or derailing of chain. Roll back gates to be fitted to prevent rafts from sliding backwards down conveyor. Additional sensor fitted to identify stationary rafts in pool immediately prior to conveyor will identify flip risk.
Depth of watercourse immediately prior to conveyor load	Approx. 2m pool – non compliant with AS	Depth could potentially result in raft being flipped in this space	Alarm/Code 6 activation	1	4	4	Platforms and rails to be added to reduce depth/risk of flipping.

[455] T14-34, lines 7-20
[456] Ex B12(8)
[457] Ex B3C(26), [11]

288. The chart shows how the Likelihood (L), Consequence (C) and overall qualitative risk (R) was rated by the evaluation team. The R measurement of four for most of the potential hazards cited suggested that they were a 'low risk'. The risk of rafts sliding backwards and colliding was found to be 12, which is in the 'high risk' rating and required management's attention.[458]

289. A further Risk Assessment was conducted on 19 October 2015, in relation to the sufficiency of the CCTV monitoring at the TRRR, which consisted of one small monitor broken up into nine screens.[459] It was thought that a further screen would allow the Ride Operator at the Main Control Panel to have better visibility of the ride in order to evaluate the risks in the 'ride envelope'.[460] It is significant to note that one of the reasons for the need to be able to evaluate the risk of the ride was **increased ride breakdowns in recent months.**[461]

290. Ms. Ramsay and Mr. Jason Johns subsequently attended the TRRR for the purpose of conducting a 'risk assessment' of the issue, which consisted of examining the monitors and speaking to the Ride Operators on shift to ascertain their thoughts on whether the change would be of assistance.[462] The risk assessment was subsequently sent to Mr. Fyfe, and a work order generated.[463] An extra larger screen was installed at the ride as a result.[464]

291. The Risk Assessment Form, and findings reached, are as follows:[465]

Task/Topic/Issue	Description of Hazard	Description of potential hazard	Current control measure	L	C	R	Comment
Monitor – surveillance of ride area	Monitor split into 9 screens (5 in use, 4 not) making the size of the screens in use too small to evaluate risks in ride area	Inability to see risks in the ride area – Has the potential to miss persons in the water/ride area	1 x monitor split in to 9 small screens	3	3	9	Additional monitor available if needed.
Increased ride breakdowns in previous months	Inability to see potential danger to guests	Injury to guest, guests in restricted area, guest in water	1 x monitor split in to 9 small screens	3	3	9	

292. Whist a score of nine on the risk analysis matrix was found to be a 'moderate risk', it was noted in the risk assessment that Attractions Supervisors had the ability to source another monitor if required, and could increase the size to make it easier for Operators to see guests in rafts, guests that have the potential to fall in the water, guests in restricted areas and another potential danger that arises during the operation of the ride. It was specifically recognised that, *'As we are unable to lose one camera, the recommendation is to have one monitor with 4 split screens and an additional monitor with 1 big screen to monitor rafts as they*

[458] Ex B12(8), pg. 2
[459] Ex C5(23)(c), pg. 13; Ex C5(23)(d)
[460] Ex C5(23)(d)
[461] Ex C5(23)(d)
[462] Ex C5(23)(c), pg. 14
[463] Ex C5(23)(c), pg. 15
[464] Ex C5(23)(c), pg. 15
[465] Ex C5(23)(d)

*approach the conveyor area. This is the area that is **high risk** if there is a breakdown on the ride'*.[466]

ENGINEERING & TECHNICAL (E&T) DEPARTMENT

293. At the time of the incident, Mr. Christopher Deaves was the General Manager of the E&T Department, whom consisted of around 40 staff members, 25 of which worked on amusement rides at the Park.[467] He was not a qualified engineer, although he had an Advanced Diploma in Mechanical Engineering as well as trade qualifications in metal fabrication.[468] He commenced employment with Dreamworld in April 2012.

294. As the General Manager of Engineering, Mr. Deaves describes his responsibilities as including asset management through repairs and maintenance, which includes amusement rides as well as other varied business facilities.[469] He previously worked at Village Roadshow for 12 years as the Engineering Coordinator, where he had oversight of the Engineering Department for Sea World, Movie World, Wet 'n' Wild, Paradise Country and Australia Outback Spectacular.[470] When Mr. Deaves was first recruited by Dreamworld, he reported to Mr. Bob Tan, who was the General Manager of Engineering and Special Projects. The position Mr. Deaves occupied had reportedly been vacant for some time.[471] Mr. Tan left Dreamworld in January 2016.[472] He is presently the Vice President of Technical Developments at PT Trans Studio in Indonesia.[473]

295. Upon commencing at Dreamworld, Mr. Deaves found that the records and document control, including for the rides, safety systems, maintenance and training of staff, were significantly lacking, with the limited information available difficult to navigate for the purpose of retrieval, cataloguing and distribution.[474] Compared to the document control architecture in place at Village Roadshow, Mr. Deaves described that at Dreamworld as needing to evolve, with the first step being to ensure that the right information was available.[475] He notes that he was focused on addressing the asset management system, which was to interface with the safety management system, of which MEX was a large component.[476] However, without a formal document and control system in place, he notes that, *'most of the platforms to manage safety of all asset management were failing because the information always wasn't available and it wasn't available to everybody who needed it'.*[477] The sourcing and storage of information was also difficult, as it was not easy to locate and therefore hard to determine whether the requisite up to date information as to ride, maintenance and staffing had been maintained.[478] Mr. Deaves commenced by trying to gather information and records to create an asset register so as to determine whether each of the rides were compliant with various specifications and the requisite Australian Standards.[479] Once all of the information had been collated and it was

[466] Ex C5(23)(d)
[467] Ex B3C(46), pg. 10 & 11
[468] Ex B3C(46), pg. 6
[469] Ex B3C(46), pg. 6
[470] Ex B3C(46), pg. 7
[471] Ex B3C(46), pg. 8 & 9
[472] Ex B3C(54), pg. 3
[473] T29-3, lines 24-32
[474] Ex B3C(46), pg. 12 & 51
[475] Ex B3C(46), pg. 13
[476] T22-36, lines 3-18
[477] Ex B3C(46), pg. 14
[478] Ex B3C(46), pg. 55
[479] Ex B3C(46), pg. 55

determined to be adequate, he intended to develop systems to ensure this document control continued, which was still taking place at the time of the tragic incident.[480] According to Mr. Deaves, this was an '*enormous process',* which he estimated would take at least two years.[481]

296. Mr. Scott Ritchie was the Engineering Supervisor (Electrical), with Mr. Mark Watkins and Mr. Wayne Cox performing the role of Engineering Supervisors (Mechanical). Mr. Ritchie is a qualified electrician, having commenced in the role of Electrical Supervisor in 2013.[482] Mr. Watkins and Mr. Cox are both qualified fitters and turners, with a wealth of experience.

297. Engineering Supervisors were required to manage teams of E&T staff and co-ordinate and supervise daily work, as well as plan maintenance to be undertaken within the Park.[483] All of the Engineering Supervisors reported to Mr. Deaves.

298. Within the E&T Department there were qualified electricians, fitters and turners, mechanics, boilermakers, welders, trades assistants and apprentices.[484] The electrical team, which consisted of a number of electricians, including Mr. Jacob Wilson, Mr. Quentin Dennis, Mr. Mark Palmer, Mr. Daniel Thompson, Mr. Francois De Villiers and Mr. John Lossie were specifically managed by Mr. Ritchie.[485] Their responsibilities on any given day included the following:[486]

- Performing prescheduled maintenance of equipment around the park on any electrical components (which includes pumps, motors and anything electrical); and

- At times, undertaking the role of electrical 'Park Technician' and attending breakdowns of any electrical components of rides. This includes attending rides to resolve any issues, as well as carrying out general electrical repairs for items, such as air conditioners, power points, lighting and switches.

299. Within the E&T Team, daily pre-start meetings with all staff allocated on shift that day were generally held, conducted by the Supervisor rostered that day.[487] Topics discussed during these meetings included who was allocated to which ride, nominations of the Park Technicians for the day, procedures and any faults that had been experienced on rides the previous day.[488] Weekly safety meetings were also conducted, and generally took place on a Wednesday for all staff.[489]

300. Informal 'Take 5' or 'Toolbox' meetings were also conducted, which typically occurred at least once a month to discuss specific work related issues and safety topics.[490] These sessions were conducted by the Engineering Supervisors or Mr. Deaves, with the information discussed being placed on the Notice Board for all employees to read. Formal training was also provided in relation to specific safety issues and procedures, such as chemical training, low voltage rescues or lock-

[480] Ex B3C(46), pg. 57 & 58
[481] Ex B3C(46), pg. 58; T22-88, lines 10-47
[482] Ex B3A(18), [5] & [6]
[483] Ex B3A(18), [9] & [10]
[484] Ex B3C(6), [4]
[485] Ex B3C(12), pg. 2; Ex B3C(38), [12]
[486] Ex B3C(12), pg. 2; Ex B3C(38), [13]
[487] Ex B3C(38), [22]; Ex C5(29)(a), pg. 7
[488] Ex C5(29)(a), pg. 7
[489] Ex B3C(13), [20]
[490] Ex B3C(38), [19]

out procedures.[491]

301. Two Park Technicians were rostered each day from the E&T Department, who were responsible for attending each of the ride breakdowns.[492] They were required to attempt to diagnose the issue and rectify it if possible. Other specialty staff were also able to be called to assist with the issue, if necessary. The response was time-based, so extra support would be provided if a fault could not be rectified in a certain time.[493] Whilst it was intended that one of the Park Technicians be from the electrical specialty and the other mechanical, it was sometimes the case that, due to staff constraints, both of the nominated Park Technicians were mechanical staff.[494]

Safety Issues Identified by E&T Staff

302. According to Mr. Wilson, an electrician, staff were encouraged to communicate any safety issues with a Supervisor at any time, which could be informing a direct line Supervisor or another of the E&T Department supervisors.[495] If any concerns were held by a member of the E&T Department as to the safety of a ride, this was to be escalated to an Engineering Supervisor to consider having it shut down. This decision rested with the Supervisor.[496] Mr. Lossie shared this view, stating that all employees had the authority to express safety concerns about a ride to an E&T Supervisor or Mr. Deaves.[497] Mr. Cox reiterated this was the case, and that he would make a determination as to the further action necessary.[498]

303. Down-time reports for rides were clipped up on the whiteboard in the Engineering workshop for all staff to consider.[499]

304. It does not appear that 'risk assessments' of rides within the park were carried out by members of the E&T Department prior to the incident.[500] Evidence provided by staff within the Department suggests that the team were delegated to develop and implement controls for a potential hazard, once this had been brought to the attention of the E&T Department.[501] According to Mr. Deaves, he recalls participating in a few ride risk assessments in relation to components of rides at the request of other Departments, however, describes them as '*very ad hoc*'.[502] He was unaware if there was any documentation to reflect that such an assessment had taken place.[503] Mr. Murphy, the maintenance manager, notes that whilst no one had the specific task of conducting risk assessments on rides or specific components, it was expected that if a staff member identified a problem they would report it.[504]

305. It does not appear from the records available, and the accounts of senior staff, that a full risk assessment of the TRRR was ever undertaken internally by

[491] Ex B3C(38), [20]
[492] Ex B3C(11), [24]
[493] Ex B3C(11), [24]
[494] T9-29, lines 23-35
[495] Ex B3C(12), pg. 4
[496] Ex B3C(12), pg. 4
[497] Ex B3C(38), [25] & [26]
[498] Ex B3C(7), pg. 15
[499] Ex B3C(12), pg. 4
[500] Ex C5(29)(a), pg. 15; Ex B3C(7), pg. 10; Ex B3C(53), pg. 9
[501] Ex C6(27), [58]
[502] Ex B3C(46), pg. 29 & 30
[503] Ex B3C(46), pg. 31
[504] T11-14, lines 35-45

Dreamworld.[505] Mr. Deaves states that to his knowledge, there had not been any 'formal assessment' of the load and unload area of the TRRR.[506] Whilst the ride was inspected daily by E&T staff, there was no regular assessment process to proactively determine whether hazards existed on rides, including the TRRR.[507] Rather, issues would only be considered reactively, when an incident occurred.[508] Furthermore, staff within the E&T Department were not aware of any previous risk assessments that may have been carried out on the TRRR.[509]

306. Mr. Deaves describes the Operations Department as owning the device or ride, and the E&T Department as the maintainers.[510]

Training for E&T Department Staff

307. Staff have stated that for new members of the E&T Department one on one learning sessions were provided, until a staff member was assessed as competent for a particular ride.[511] Each person deemed competent to maintain a ride, would be noted in the log book located at the ride.

308. Staff from the E&T Department have previously participated in some training and drills for emergency response and management, which include tiger escapes and simulated emergency response drills for the Buzzsaw ride.[512]

309. Electrical staff also participate in role specific training from time to time, including low voltage rescues, and CPR and First Aid courses (which are undertaken annually).[513] New procedures for rides, such as lock-out tag-out training is also completed, the most recent prior to the incident being in early 2016.[514]

Role of Junior Engineer

310. In September 2014, Mr. Gen Cruz was employed as a junior engineer to work within the E&T Department at Dreamworld reporting to Mr. Deaves.[515] He had an engineering degree, which he obtained in 2013.[516]

311. According to Mr. Deaves, Mr. Cruz was recruited for two main purposes, one of which was to consider the efficiency of the utilities, such as water, gas and electricity within the Park. The second was to gather current information and data as to rides, maintenance and training.[517] He was not employed to undertake risk assessments of the rides, and it was recognised that he did not have the necessary skills to do so.[518] It appears that Mr. Cruz was required to consider and audit the records pertaining to each ride, referred to as 'data mining compliance', which he commenced with the Class 5 thrill rides.[519] This involved identifying gaps in the information retained by Dreamworld with respect to the

[505] Ex B3C(46), pg. 75
[506] T22-35, lines 23-30
[507] T22-44, lines 7-22; 22-47, lines 1-10
[508] T22-47, lines 18-48
[509] Ex B3C(7), pg. 10
[510] Ex B3C(46), pg. 30
[511] Ex B3C(13), [19]
[512] Ex B3C(12), pg. 3
[513] Ex B3C(12), pg. 3
[514] Ex B3C(12), pg. 3
[515] Ex B3C(53), pg. 5
[516] Ex B3C(53), pg. 6
[517] Ex B3C(46), pg. 73
[518] Ex B3C(46), pg. 73
[519] Ex B3C(46), pg. 88

rides.[520]

312. Mr. Cruz described his responsibilities as a project relating to '***ride auditing'***, by considering existing maintenance programs within Dreamworld for each of the rides, and ensuring that they harmonised with the national audit tool and were up to date with the manufacturers' specifications, standards and regulations.[521] He was also considering the power and water usage around the Park. Mr. Cruz states that in order to perform his role, he considered AS-3533 Part 3, which relates to in-service inspections, for which he was mentored directly by Mr. Deaves.[522] He subsequently developed checklists, which he went through for each of the rides, in consultation with Mr. Deaves.[523]

313. With respect to the TRRR, prior to the tragic incident, Mr. Cruz had not conducted a risk assessment of the ride, nor considered the maintenance program.[524] He does not recall ever sighting a documented risk assessment relating to the TRRR.[525] According to Mr. Deaves, Mr. Cruz was only a few months away from considering the TRRR as part of his audit.[526] The difficulty associated with locating the information pertaining to the ride was that it wasn't in a central location, but rather detailed in paper-based records, and also on individual's computers and hard drives.[527]

314. During the inquest, Mr. Cruz stated that he had been instructed to prioritise the nine Big Thrill Rides (Class 5 rides), with the TRRR toward the end of the list of rides to audit as it was a Class 2 ride.[528] The decision on how rides were prioritised rested with Mr. Deaves.[529] Mr. Deaves explained during the inquest, that Class 5 rides had more complex systems controlling them, and as such, the inspection criteria under the Australian Standards would be higher.[530]

315. Mr. Cruz confirmed during the inquest that he did not conduct any engineering risk assessments of any of the rides at Dreamworld prior to the tragic incident.[531] Mr. Deaves stated during the inquest that following the mining of information being undertaken by Mr. Cruz for each ride, the next step was '*hazard discovery*'.[532] This process had not commenced at the time of the tragic incident.

316. Following the tragic incident, Mr. Cruz's role changed 'dramatically' whereby he is now more involved in the corrective actions imposed by external auditors.[533]

Mr. Bob Tan's Role

317. Mr. Tan was the longest serving staff member of the E&T Department, ceasing employment with Dreamworld around 10 months before the tragic incident. He commenced working at the Theme Park in September 1987, initially as an

[520] 11-105, lines 1-18
[521] Ex B3C(53), pg. 6 - 8
[522] T11-93, lines 5-35
[523] T11-93, lines 40-47
[524] Ex B3C(53), pg. 8; T11-94, lines 37-45
[525] Ex B3C(53), pg. 8 & 9
[526] Ex B3C(46), pg. 96
[527] T22-37, lines 32-45
[528] T11-94, lines 40-50
[529] T11-96, lines 37-40
[530] T22-37, lines 10-35
[531] T11-101, lines 1-5
[532] T23-100, lines 1-20
[533] Ex B3C(53), pg. 7

Assistant Maintenance Controller.[534] He held a Diploma in Mechanical Engineering awarded by Singapore Polytechnic in 1976, and whilst employed by Dreamworld, he obtained First Class Honours in Mechanical Engineering from QUT in 1992, and a Post Graduate Diploma from QUT in Project Management in 1994.[535] He became the Technical and Services Director at Dreamworld in 1996, before being moved to Special Projects briefly in 2004.[536] He was appointed as the General Manager of Engineering in 2007, before becoming the General Manager of Special Projects in 2014.[537]

318. In 2005, Mr. Tan was given the responsibility of project managing the development of White Water World, as well as the introduction of the new ride, the FlowRider, at Dreamworld.[538]During this time, given the scope of the project, the role of the General Manager of Engineering was filled by Mr. Tony Hawkins.[539] By 2007, Mr. Tan had returned to being the General Manager of Engineering for Dreamworld, however, in addition, he retained the responsibility of implementing new rides at the Theme Park.[540]

319. As the Engineering Manager at Dreamworld over a number of years, which included between 2007 to 2013, Mr. Tan's responsibilities, per the position description prepared, appear to have included the following:[541]

- Oversee the maintenance of all rides, plant, equipment, property and operating assets; define and review preventative maintenance schedules to optimise efficiency, safety and best practice methods.
- Establish engineering methods, policies and procedures and oversee their implementation to give effect to safety policy.
- Direct the regular review of plant and equipment to ensure it meets safety, efficiency and quality requirements and report on other options available to achieve objectives.
- Implement approved safety-related actions as determined by Safety Executive Committee, QEST and audits.
- Establish the systems for and oversee the keeping of maintenance records.
- Ensure activities related to the engineering and technical function comply with relevant Acts, legal demands and ethical standards.

320. As the Engineering Manager, Mr. Tan had the authority to:[542]

- Take actions and issue inspections that may be reasonably required to assure safety of any ride, equipment or asset;

[534] Ex B3C(54), pg. 3
[535] Ex B3C(54), pg. 3
[536] Ex J1
[537] Ex B3C(54), pg. 6; Ex J1
[538] T29-8, lines 2-18; Ex J1
[539] T29-8, lines 5-20
[540] T29-8, lines 22-30; Ex J1
[541] Ex C7(20), pg. 2
[542] Ex C7(20), pg. 3; T29-55, lines 35-45

- Sign off on expenditure up to the delegated amount; and

- Represent the company to statutory body officials in regard to technical matters.

321. Whilst Mr. Tan held a number of different positions during his almost 30 year tenure with Dreamworld, given his expertise and experience, it is clear that he was consistently involved in the engineering aspects and decisions made at the Theme Park. Whilst he primarily reported directly to the CEO, at different times, he also had various staff reporting to him, including the Engineering Manager.[543]

322. Mr. Tan claims that in relation to decisions as to the conduct of 'safety audits' of amusement ride, directives were given by the Board to the CEO, who in turn allocated such matters to the Safety Manager and Mr. Tan to implement.[544] Records in relation to these audits were maintained by the Safety Department.[545]

323. During the inquest, Mr. Tan stated that he and the E&T Department were responsible for conducting assessments of amusement rides at Dreamworld to the AS-3533.[546] He claims this was done by way of the daily inspections and '*our regime of periodic inspections on equipment*', including the annual shutdowns.[547] He clarified that this did not involve considering the design of the ride, pursuant to AS3533.1, but rather the maintenance requirements in Part 2 and 3.[548]

324. Mr. Tan left Dreamworld in January 2016 in order to accept a role in Dubai. Following his departure, Mr. Tan's hard drive was retained by the Theme Park, as it contained a number of significant historical and current records relating to the engineering aspects and history of the rides, including drawings, manuals, incident reports, design registration documentation, as well as electrical, mechanical and structural drawings and documentation.[549] It appears that the contents of this hard drive was gradually integrated into the broader system held by Dreamworld, however, was only accessible by E&T staff.[550]

325. During the inquest, Mr. Tan acknowledged that given his long tenure at Dreamworld and the roles he performed, he had extensive knowledge of the engineering aspects of the Theme Park.[551] Nonetheless, he was unable to say where information as to a safety audit conducted on a ride or decisions made to alter or modify devices were documented and retained.[552] Mr. Tan did state, however, that up until 2000, records were maintained manually before the process of recording electronically was commenced.[553]

E&T Department Knowledge of the Design, Modifications and Incidents on the TRRR

326. From the accounts provided during the course of the investigation and inquest hearing, it is evident that only a scant amount of knowledge was held by those

[543] Ex B3C(54), pg. 4
[544] Ex B3C(54), pg. 4
[545] Ex B3C(54), pg. 5
[546] T29-27, lines 25-47
[547] T29-27, lines 30-40
[548] T29-27, lines 33-40
[549] T12-54, 55, lines 1-25 & T12-55
[550] T12-54, lines 40-48
[551] T29-9, lines 5-15
[552] T29-18, lines 1-17
[553] T29-22, lines 17-45

in management positions at Dreamworld, including Mr. Deaves, as the General Manager of Engineering, as to the design, modifications and past notable incidents on the TRRR.[554]

327. Mr. Deaves was unaware as to when any of the changes to the TRRR, such as the removal of the turntable or the conveyor slats, had been undertaken, or the reasons why such alterations were made.[555] Mr. Deaves noted that to his knowledge, there had not been any 'formal assessment' of the load and unload area of the TRRR.[556] Whilst the ride was inspected daily by E&T staff, there was no regular assessment process to proactively determine whether hazards existed on rides, including the TRRR.[557] Rather, issues would only be considered reactively, when an incident occurred.[558]

328. It was recognised by Mr. Deaves that there were no records kept, which were easily accessible or centrally located, whereby staff responsible for the safety of the rides, both from an operations and engineering perspective, could examine and consider previous issues associated with a device. This absence of effective and complete record keeping essentially precluded any staff from being in a position to be able to appropriately and adequately assess and manage the risks, which may be present on rides, particularly those like the TRRR, which was 30 years of age. It is significant that the General Manager of Engineering at Dreamworld had no knowledge of past incidents involving rafts coming together on the TRRR. It is arguable that this lack of knowledge essentially prevented him, and anyone else, from assessing or determining risks associated with the TRRR from an engineering perspective.

329. Furthermore, it became clear during examination at the inquest that Mr. Deaves had a very limited knowledge of the operation of the ride and the various components. Whilst his role may have involved a heavy administrative and coordination component, the fact that there was no one employed at Dreamworld who was dedicated or qualified to undertake full risk assessments of the rides, including the TRRR, from an engineering and hazard perspective, is of significant concern.[559]

330. Mr. Deaves acknowledged during the inquest that given the previous incidents, which had occurred on the TRRR, a root cause analysis should have been conducted, to determine whether engineering upgrades or modifications needed to be made to the TRRR to ensure that contact between rafts didn't happen again.[560]

331. Whilst Mr. Tan, given the duration of his tenure and involvement, was expected to have retained personal knowledge of these modifications, when he left Dreamworld in 2016, records as to the alterations made and reasoning were scant and difficult to locate.

332. In relation to the TRRR, Mr. Tan claims that he had no direct knowledge of the design of the ride as it was already in operation when he commenced

[554] Ex B3C(46), pg. 92; Ex C8(6), pg. 18; T19-48 & 49; T23-4 - 9
[555] Ex B3C(46), pg. 92 & 93
[556] T22-35, lines 23-30
[557] T22-44, lines 7-22; 22-47, lines 1-10
[558] T22-47, lines 18-48
[559] T23-9, lines 40-45
[560] T23-5 & 6

employment with the Theme Park.[561] He was aware of issues associated with the rotating table initially in place on the ride, and the conveyor motor power capacity.[562] The modifications subsequently made to address these issues were to rectify the bearings and track, as well as reducing the load on the conveyor by removing the number of slats.[563] Mr. Tan claims that whilst he was aware that there were no manufacturer's specifications and recommendations as the ride was built in house, the maintenance schedule and strategy for the ride was developed prior to his commencement at Dreamworld.[564] He acknowledged that he was involved in the additions and changes made to the TRRR up until the time he resigned from Dreamworld.[565] He further stated that whilst there was no formal process for considering holistically the component parts and maintenance suggestions for the ride, this was done.[566]

333. In relation to the 'nip point' between the end of the conveyor and steel support rails on the TRRR, Mr. Tan stated during the inquest that he never identified this as an issue from an engineering perspective.[567]

334. According to Mr. Tan, engineering controls were considered for the TRRR to stop the conveyor in the event of a pump failure, however, a safer system could not be identified.[568] Mr. Tan noted, *'simply stopping the conveyor if a pump failed had the potential to create new hazards and risks'.*[569]

335. Mr. Tan was unable to recall whether consideration had been given to the installation of an interlock system shutting down the conveyor automatically in the event that a raft was stranded on the support rails positioned near the unload area, shortly after the end of the conveyor for a period of time, or from a reduced water level.[570]

RIDE MAINTENANCE AT DREAMWORLD

336. For each ride, including the TRRR, daily, weekly, monthly and yearly checks by various Departments within Dreamworld were conducted. The E&T Department were responsible for carrying out these tasks at the direction of Mr. Deaves and the Supervisors.

337. Mr. Stephen Murphy was the Maintenance Team Leader at Dreamworld at the time of the tragic incident, a position he had held for 2 ½ years.[571] He is a qualified fitter and turner.[572]

338. Mr. Grant Naumann, a qualified fitter and turner, was the Maintenance Planner at Dreamworld, having held this position since 2007.[573] He reported to Mr. Deaves.[574] A position description relating to Mr. Naumann's role describes the purpose of the position was, *'to provide leadership, training and management of*

[561] Ex B3C(54), pg. 5 & 6
[562] Ex B3C(54), pg. 6
[563] Ex B3C(54), pg. 6
[564] T29-11 & 12
[565] T29-12, lines 7-24
[566] T29-12, lines 28-40
[567] T29-16, lines 35-48
[568] Ex B3C(54), pg. 13
[569] Ex B3C(54), pg. 13
[570] Ex B3C(54), pg. 14
[571] Ex B3C(13), [7]
[572] Ex B3C(13), [12]
[573] Ex B3C(14), [5]
[574] Ex B3C(15), pg. 5

outlined reports within the technical services department and ensure all procedures are adhered to in accordance with the business.'[575] He was responsible for the servicing and maintenance of equipment and all buildings at Dreamworld to the prescribed standards to ensure their safe and efficient operation.[576] This responsibility included the annual maintenance of all major rides from an administrative perspective, for which he was required to supervise the process, organize and direct staff.[577] According to Mr. Naumann, the prescribed standards applicable to his role related to the requirements of the Original Equipment Manufacturer, AS-3533 and any regulatory requirements, for which he was not provided with any specific training.[578]

339. Mr. Naumann states that he was hired by Dreamworld to assist with the implementation of the computerised maintenance management software, known as MEX, which included the scheduling of works on rides through work orders.[579]

340. The MEX system allowed for preventative maintenance to be scheduled for a ride, which was manually controlled by Mr. Naumann, who was also responsible for generating the associated work orders.[580] Whilst he was aware of the Breakdown Policy for rides, he was not notified of any breakdowns on rides.[581]

341. According to Mr. Naumann, work orders for maintenance and changes to rides could be generated by the Safety Department or Mr. Deaves as the head of the E&T Department, following the identification of an issue, or based on recommendations made by JAK and other external auditors.[582] A MEX ops is the avenue available for members of other departments, such as Food and Beverages or Attractions, to request certain maintenance work be undertaken.[583] Such requests could be declined if capital expenditure was needed, which would require a supervisor to obtain the relevant permissions or for a necessary risk assessment to be carried out.[584] To the best of Mr. Naumann's knowledge, risk assessments of the rides were carried out by the Safety Team at Dreamworld and not the E&T Department.[585]

342. In terms of records retained in relation to maintenance at Dreamworld, whilst log books were not maintained, daily work orders and spreadsheets were kept for each ride, with annual maintenance information recorded on a spreadsheet listing the tasks to be performed and those who had actioned it.[586] Mr. Naumann stated during the inquest that he was only '*vaguely*' aware of where the various maintenance tasks lists for the TRRR, as an in-house custom built ride, were generated.[587]

343. Mr. Deaves claims that whilst budgetary constraints at Dreamworld may have impacted on requests to rectify negotiable components of the Park, such as presentation like paint work, upgrades or changes to safety systems and the

[575] Ex C7(21)
[576] Ex C7(21)
[577] Ex B3C(14), [6] & [10]
[578] T11-40, lines 25-47
[579] Ex B3C(15), pg. 4
[580] Ex B3C(15), pg. 5; Ex B3C(15), pg. 8
[581] Ex B3C(15), pg. 9
[582] Ex B3C(15), pg. 17; see Procedure Ex D7(847)
[583] Ex C5(28)(a), pg. 17
[584] Ex C5(28)(a), pg. 17
[585] Ex B3C(8), pg. 11
[586] Ex C5(28)(a), pg. 14
[587] T11-75, lines 14-41

maintenance of the rides were not delayed or refused due to cost.[588]

Daily Inspection

344. Checklists were developed for each ride listing the items that needed to be examined and inspected by maintenance and engineering staff on a daily basis.[589] The time taken to carry out and complete the requirements of each checklist differed. It was estimated that the daily service and inspection of the TRRR was around 35 minutes to 60 minutes for two staff.[590]

345. For the TRRR, staff were required to check a number of points on the ride including:[591]

- *Operators Report* - carrying out any repairs listed
- *Operation:* remove ride inhibitors and E-stop lanyard function
- *Conveyor:* Various including chains, planks and bolts, chain-break sensor
- *Raft Gates:* Various including pivot bushes and pins, gate operation
- *Rafts:* Various including tubes check for damage, tube inflation, seating plug, seat belt security and integrity, drain rafts.
- *Pumps:* Spider bearings and glands
- *Waterway:* Various including barriers, logs and water top-up
- *Animation:* Tunnel lights and animation operational
- *Camera:* Check operation 5 off
- *Filter:* back wash filter under Mine raft
- *Rafts in use:* Number of rafts in use circled

346. Each of these components, once checked, was required to be initialled by the competent person. These daily checks were conducted by members of the E&T Department, however, an electrician (members of this group) was generally not involved unless an electrical issue was identified by the technicians undertaking the checks.[592] On average, it took a team of two staff from the E&T Department 40-45 minutes to complete the requisite checks daily.[593]

347. It was noted by members of the E&T Department that the conveyor planks were checked regularly and replaced if there was any sign of damage or they were deemed to be in poor condition.[594]

[588] Ex B3C(46), pg. 17 & 18
[589] Ex B12(2) – example of daily pre-service inspection of the TRRR 12th October 2016
[590] Ex F16C(10) – estimated provided to JAKS in 2004; Ex B12(2) – notation of total man hours taken
[591] Ex B12(2)
[592] Ex B3C(12), pg. 3
[593] Ex B3C(6), [13]
[594] Ex B3C(11), [33]

348. In the event that an issue with a ride was identified during the daily inspections, E&T staff were required to escalate it to the shift Supervisor for a determination to be made as to whether a maintenance work order needed to be generated for rectification.[595]The urgency by which corrective action needed to be undertaken would determine the priority placed on the work order.[596]

Daily Operator Pre Start Up and Post Operation Shutdown Sheets

349. At each ride, a daily record of checks by Operations and E&T staff is maintained. These are designed to ensure the '*safe daily operation of rides and correct closure at the end of the day*'.[597] Before a ride is able to be opened for the day, these inspection sheets, which also record the completion of the E&T Department inspections, in addition to the pre-operation check by the ride attendants, have to be completed.[598] Prior to an Operator leaving the ride at the end of the day, the post shutdown checks need to be completed.[599]

Breakdown Procedure

350. A formal Breakdown Procedure ('the Procedure') was in place at Dreamworld, which outlined *'the procedure to be followed when a major ride or piece of equipment is out of service or reduced capacity due to equipment fault or failure'.*[600] This document was authored by Mr. Deaves.[601]

351. The TRRR was a 'major ride' within the meaning of the definitions in Part 4 of the Procedure.

352. Part 5 of the Procedure provided:

- The first response to a breakdown call is to ascertain if there is any immediate danger to persons or equipment. If so, isolate the danger. If you are unsure how to do this safely, call a Supervisor BEFORE proceeding.

- If there is no immediate danger attempt to ascertain the fault with the equipment. If the fault is clearly evident and the repair can be effected within 15 minutes, carry out the repair and report to the Supervisor at the next available opportunity.

- If there is a repeat of the fault within the next 24 hours do not attempt to rectify the fault until the Engineering Supervisor has been notified and given authority to rectify the problem.

- If the equipment is likely to be inoperable for more than 15 minutes the Engineering Supervisor must be called.

- For any equipment that is inoperable for more than 1 (one) hour or is required to operate at reduced capacity, the Engineering Manager must be notified. If a repair or alteration is required to be performed on any control circuitry or on any other part or component of a piece of essential safety

[595] Ex B3C(15), pg. 19
[596] Ex B3C(15), pg. 19
[597] Ex B12(26), pg. 19
[598] Ex B12(15); Ex B12(26), pg. 19
[599] Ex B12(26), pg. 19
[600] Ex B3A(19), pg. 53 & 54
[601] Ex B3C(46), pg. 81

equipment. The Engineering Supervisor must be notified and an independent functional safety test should be carried out before the equipment is permitted to return to service. The Engineering Manager will report to the General Manager accordingly.

- If the cause of an issue can't be positively identified the Supervisor is to be called and all parties must be satisfied there are no problems operating the equipment.

- At no time will any safety control systems be compromised to allow for equipment availability. Any discussion on acceptable criteria under this procedure must include the involvement of the Engineering Supervisor or the Engineering Manager. The Engineering Manager will report to the General Manager accordingly.

- Should a fault or failure occur to a critical component the Engineering Supervisor and/or the Engineering Manager MUST be consulted to ascertain if further checks are to be carried out.

- This procedure MUST be followed even when the fault is clearly diagnosed and seems to be of an insignificant nature. Examples of equipment requiring reporting would be: harnesses, brakes, zone and speed control systems.

- During any absences by the Engineering Manager or General Manager, a delegation of authority will remain in effect until either returns to work.

- If a device is to operate at reduced capacity or with a known non critical maintenance issue an action plan must be put in place from the person giving authority to continue operating.

353. Mr. Deaves stated that it was his intention for the Procedure to reflect that if there was a reoccurrence of a fault within a day (24 hour period), then it was to be escalated to a Supervisor.[602]

354. There was some discrepancy in how this Procedure applied to ride breakdowns across the Park and when rides would be shut down. According to electrician, Mr. Dennis, his understanding was that if there were two breakdowns on a ride in one day, then the Supervisor was to be advised, and could decide whether the ride remained open.[603] He states that some staff believed that it was three breakdowns in one day.[604] Mr. Gordon was of the view that, based upon a verbal direction given by Supervisor, Mr. Wayne Cox during an early morning meeting, a fault had to occur three times before it was escalated to a Supervisor.[605] Mr. Cox described the Procedure as follows, *'we have a policy that if there are three faults with a ride within the same day, then we close the ride down to source and rectify the problem.'*[606] Mr. Cruz also shared this view based upon a discussion during a meeting in October 2015, whereby it was stated that the escalation of a fault to a Supervisor was to occur after the third occasion.[607]

[602] Ex B3C(46), pg. 81
[603] Ex B3C(44), pg. 16 & 17
[604] Ex B3C(44), pg. 17
[605] Ex C5(29)(a), pg. 13 & 14; T10-80, lines 30-46; T10-83, lines 4-15
[606] Ex B3C(6), [16]
[607] Ex B3C(53), pg. 13

355. From the various accounts provided by members of the E&T Department, there was clearly some confusion as to how this policy was to be applied, and whether a fault needed to occur two or three times before it was escalated to a Supervisor to consider whether the ride needed to be shut down for safety issues.[608] Whilst the written Procedure was kept in the workshop, it seems that a verbal direction may have been given, which suggested that the same fault needed to occur three times before it was necessary to escalate it to a Supervisor.[609] Regardless of whether this was the case or not, it was evident that there was a lot of confusion amongst experienced members of the E&T Department as to what the applicable policy was in relation to ride breakdowns. It appears that some members of the E&T Department had not seen the formal written Procedure for some time prior to the incident, and were relying on verbal accounts.[610]

356. Furthermore, in relation to ascertaining what may constitute *'immediate danger'* for a particular ride, including the TRRR, there was no specific training provided to staff nor any guidance outlined in the Procedure.[611] During the inquest, evidence was given that staff were not provided with training as to any particular risks or dangers, which might be present for a ride, or any particular component of a ride.[612]

Park Technician Procedure

357. Dreamworld also had in place a Park Technicians Procedure,[613] which was a formalised document required to be followed by an E&T staff member nominated for the role on a particular day. The reference document listed as part of this procedure was the '*Breakdown Policy*', which it can be assumed was intended to be a reference to the 'Breakdown Procedure'.

358. The Park Technician Procedure stipulates the following:

- On any day during park operating hours there will be at least two people/staff assigned to the role of Park Technician. One should be Electrical and the other Mechanical.
- Unless committed to a higher priority both technicians should attend a call and stay with the rectifications work until complete or otherwise directed.
- If multiple requests are received simultaneously, the Park Technicians should contact their Supervisor for assistance.
- Should the situation be, that the first call can be safely completed by 1 (one) technician, they may separate to attend another call.
- Park Technicians should have their breaks at different times to the majority of engineering staff to allow for responsibility hand over during their breaks.

[608] Ex C5(29)(a), pg. 13 & 14; Ex B3C(8), pg. 8 & 9; T5-27
[609] Ex C5(29)(a), pg. 14
[610] T5-27, lines 35-47
[611] T7-61, lines 25-45
[612] T7-61, lines 33-45
[613] Ex B3A (19), pg. 56 & 57

- When called to a breakdown, the Breakdown Procedure MUST be followed.

- If the Park Technicians do not have sufficient experience or training in the area of need, they are to call their Supervisor for further support BEFORE undertaking any rectification work.

- Generally, it would be expected that a Park Technician with lesser experience would be coupled with an experienced Park Technician, to assist with locations, company policies and procedures, and the decision making process.

- Two way code will be mechanical 5 and calls will be taken directly by the technician.

- Where practical, there should be a brief meeting between the Park Technicians and a senior staff member before the start of each operation shift.

- Topics covered during meetings should include:

    - Any special events for the day/night
    - Any rides not operating or on annual shutdown
    - Reported incidents
    - Staffing – which staff are available/unavailable.

359. A printed copy of this Procedure was available in the E&T Department workshop. According to some staff, Supervisors often reminded them of the policy requirements during pre-start meetings.[614]

360. Evidence from staff suggests that this policy was introduced a few years prior to the incident when the Park Technician role was established. When the policy was first introduced, E&T staff were trained in the policy.[615] It is not clear from the recollection of staff whether refresher training was ever provided to E&T staff, either by way of targeted training or during 'Take 5' meetings.[616]

361. Any repairs or rectification of issues carried out by E&T staff were recorded in the Ride Logs, which were located in a folder at each ride.[617] The Park Technicians are required to fill out the 'Down Time' sheet in the Ride Log folder setting out what the issue was, what was done to resolve the issue, and the length of time the ride was not operating. The Down Time sheets were collated each day by the Attractions Supervisors who put the information contained in these documents into a report, which was emailed daily to Mr. Margetts, Mr. Fyfe and the E&T Team. The Down Time report is also given to the Park Technicians each morning, as well as were placed on the whiteboard in the Engineering workshop.[618]

[614] Ex B3C(12), pg. 4
[615] Ex B3C(38), [29]
[616] Ex B3C(38), [29]
[617] Ex B3C(38), [31]
[618] Ex B3C(38), [32] & [33]

TRRR YEARLY PREVENTATIVE MAINTENANCE INSPECTION

362. For each ride at Dreamworld, annual preventative maintenance inspections are conducted, which involve the shutdown of the attraction for a requisite duration, and various tasks to be completed and examined, which are stipulated on a ride specific checklist.[619]

363. In relation to the TRRR, the annual preventative maintenance inspection, which involved around eight E&T Departmental staff, included examination and servicing of the following components of the ride:

- Southern and northern pump, which included electrical connections at the motor;
- Pump area for the removal of waste material;
- Screens, which include inspection for integrity, security and corrosion;
- Trough area, which includes a visual inspection of trough joints, as well as the trough gates and logs etc. for security;
- Holding gates 1-6, which includes the operation and integrity of control valves, airlines and pivot points;
- Tunnel, where the integrity and security of concrete ceiling was to be inspected; and
- Conveyor, which included the motor (megger test and record results), Gearbox (for leaks and replace oil), drive train (sprockets for excessive wear).

364. Any repairs or upgrades to a component of the ride, including replacement parts and inspections, were to be carried out during this shutdown.[620] All task performed were documented on a spreadsheet, with the work carried out signed off by staff.[621] This sheet was retained electronically and as a hard copy.

365. In relation to the TRRR, annual maintenance required that the ride be shut down for around three to four weeks.[622]

Shutdown June 2016

366. Mr. Naumann supervised the TRRR annual maintenance in 2016.[623] He notes that the shutdown maintenance undertaken was routine, aside from replacement of the conveyor chain, which involved the removal of planks attached to the chain, so that it could be replaced, as well as some old planks replaced with new.[624] He notes that the conveyor had a mixture of new and old planks.

[619] Ex B12(12)
[620] Ex B3C(14), [11]
[621] Ex B3C(14), [11]
[622] Ex B3C(14), [9] & [10]
[623] Ex B3C(14), [12]
[624] Ex B3C(14), [12]

367. During these shut downs, external contractors would sometimes be engaged to attend the ride to service various components, including the Danfoss Variable Speed Drives (VSD's).[625] The most recent occasion that this had occurred was during the shutdown on 15 June 2016, during which the following areas were canvassed:[626]

- Back up of all drive parameters to LCP
- Check heat sink cooling fan operation
- Visual checks for 'hotspots', corrosion and vermin ingress
- Check all Line input and motor connections
- Check earthing and cable screening
- Replace filters where fitted
- Check internal fuses
- Check PCB plugs are correctly fitted and secure
- Remove dust and any other contamination
- Checks DC bus
- Check input & output Voltages & Currents
- Save all settings and other info

368. It should be noted that on this occasion, due to a breakdown of the south pump on the TRRR, both VSD's could not be test run.[627] The south pump was down for maintenance that day. Accordingly, the *'Check input & output Voltages & Currents'* component of the schedule could not be completed.[628]

RECENT BREAKDOWNS OF THE TRRR

369. On the days shortly prior to the tragic incident, maintenance and down time records for the TRRR confirm that the ride had experienced a number of breakdowns, which were primarily related to an 'earth fault' recorded on the drive of the South Pump. The relevant circumstances of each of these breakdowns are outlined below.

19 October 2016

370. The Down Time Report for the TRRR commencing the week of 17 October 2016, shows that the ride broke down on 19 October 2016 at 11:20 am with the cause cited as '***South pump tripped out – alarm earth fault'.***[629] A reset test was conducted, and the ride returned to operation at 11:57 am.

371. Electrician, Mr. Jacob Wilson attended the Main Control Panel and requested backup from other members of the E&T Department, due to the nature of the ride.[630] Team Leader, Mr. Dave Foster, Mr. Michael Stead and Mr. Mark Gordon subsequently attended the ride to assist.[631]

372. Mr. Wilson was advised by Ms. Sarah Cotter, Attractions Supervisor, that the pump had ceased to operate by itself, and the ride had been shut down.[632] Mr. Quentin Dennis attended the ride in support of Mr. Wilson, and went to the

[625] Ex B3A(22), [4]
[626] Ex B3A(22), [5]
[627] Ex B3A(22), [6]
[628] Ex B3A(22), [6]
[629] Ex B15(16), pg. 3
[630] Ex B3C(12), pg. 5
[631] Ex B3C(9), [11]
[632] Ex B3C(12), pg. 6

Control Room, where the switchboard and drives are located, to try and determine the cause of the issue.[633] He advised Mr. Wilson over the two-way radio that the South Pump display window showed an error, 'Earth Fault – Alarm 14'.[634] It was decided that the ride should be evacuated, as the error required further investigation.[635] Mr. Wilson advised the other E&T staff who had attended to assist with the evacuation of guests.

373. Once guests were evacuated from the ride, Mr. Wilson handed control of the Main Control Panel to E&T mechanical team member, Mr. Michael Stead and went to the Control Room to assist Mr. Dennis.[636] Mr. Wilson took a photograph of the error message on the south pump drive, before attempting to reset the drive. Despite pressing the reset button on the drive, the fault did not clear.[637] Mr. Wilson contacted Mr. Scott Ritchie, Engineering Supervisor (Electrical), and advised him of the earth fault.[638]

374. Mr. Dennis subsequently tried to fix the error by turning the isolator switch on the front of the drive to remove power to see if it would reset. When power was restored, the earth fault had cleared.[639] The south pump was then restarted from the main Operator control panel, and worked without issue.[640] All the rafts were moved into the home position at the dispatch area. Mr. Wilson advised Mr. Ritchie as to the process undertaken.[641]

375. On this occasion, Mr. Ritchie was notified and made the decision to have the 'drive guys' from Applied Electro attend to examine the cause of the fault. A request was subsequently made on 22 October 2016 for Mr. Michael Takac, an Electrician with Applied Electro, to attend the TRRR for a service call for the VLT.[642] Mr. Ritchie stated that, *'we have experienced an earth fault on two separate occasions and cannot fault the motor. We are back up and running now, however the sooner you are able to get to the site, the better.'*[643] He was scheduled to attend site on 27 October 2016.[644]

22 October 2016

376. At 11:05 am on 22 October 2016, a breakdown occurred at the TRRR, which was attributed to a 'South Pump earth fault'. This required the ride to be shut down between 11:05 am and 11:56 am. Mr. Wilson attended this breakdown with Mr. Mark Watkins.[645] He went to the Control Room, with Mr. Watkins stationed at the Main Control Panel.[646] He was advised that the south pump had ceased to operate by itself, however, would not be able to be restarted immediately as there were ducklings in the area that would need to be removed beforehand.[647] Guests were subsequently evacuated from the ride.

[633] Ex B3C(12), pg. 6
[634] Ex B3C(12), pg. 6
[635] Ex B3C(12), pg. 6
[636] Ex B3C(12), pg. 7
[637] Ex B3C(12), pg. 7
[638] Ex B3A(18), [29]
[639] Ex B3C(12), pg. 7
[640] Ex B3C(12), pg. 8
[641] Ex B3C(12), pg. 8; Ex B3A(18), [29]
[642] Ex F12(40)
[643] Ibid.
[644] Ex B3A(22), [8]; Ex F12(40)
[645] T17-11, lines 13-35
[646] Ex B3C(12), pg. 9
[647] Ex B3C(12), pg. 9

377. Mr. Wilson noticed that the South Pump drive had the same fault as had occurred on 19 October 2016, which he photographed. He called Mr. Ritchie over the two-way radio, who subsequently attended the Control Room.[648] Mr. Wilson performed the same reset as Mr. Dennis had on the previous occasion, which cleared the earth fault.[649] Mr. Ritchie made a comment that he was unsure if the cooling fans were working, however, this was not a significant concern, which would warrant the ride being shut down.[650] The south pump was then reset at the Main Control Panel, and the rafts were returned to the dispatch area.

378. Mr. Ritchie advised Mr. Wilson that he would get 'the drive guys' out to look at the fault.[651] Mr. Wilson offered to megger the motors (conduct an insulation resistance test), however, Mr. Ritchie stated that this was not necessary.[652]

379. Mr. Ritchie subsequently notified Mr. Deaves that day of the fault.[653] According to Mr. Ritchie he told Mr. Deaves that he believed that there was an intermittent earth fault with the drive on the South Pump, and given it was the second occurrence in four days, he intended to request that external drive specialists attend to further investigate.[654] Mr. Deaves agreed that this was an appropriate course. According to Mr. Ritchie, the TRRR was '*the most popular ride in the Park*' and he was concerned to ensure it was operating properly.[655] He further states that whilst he was motivated to have the drive specialist attend to investigate the fault, this was to avoid any further operational down-time not because he had any concern as to any risk posed from further faults.[656]

380. Mr. Ritchie subsequently sent an email to Mr. David Butler at Applied Electro, the authorised service agent for the Danfoss drives in use, requesting that they attend site to investigate the recurring issue.[657] Arrangements to have the drives looked at by external contractors was communicated by way of email to the E&T Supervisors by Mr. Ritchie that evening.[658]

23 October 2016

381. At 10:45 am on 23 October 2016, the TRRR broke down once again due to 'South pump – tripped north pump earth fault'.[659] A reset test was conducted, and the ride was returned to operation at 11:02 am. E&T team members, Mr. Stephen Murphy, Mr. Quentin Dennis and Mr. Frank De Villiers attended the Code 6 on this occasion, with Mr. Dennis and Mr. De Villiers resetting the drive in the control room, allowing the pumps to be restarted.[660] It is not clear from the evidence provided whether an E&T Supervisor was notified of this breakdown.

382. According to Mr. Dennis, he was unaware of the fault the previous day, and had not been advised by Supervisors at the morning 'tool-box' talk.[661]

[648] Ex B3C(12), pg. 9; Ex B3A(18), [32] & [33]
[649] Ex B3C(12), pg. 9
[650] Ex B3C(12), pg. 9
[651] Ex B3C(12), pg. 10
[652] Ex B3C(12), pg. 10
[653] Ex B3A(18), [39] & [40]
[654] Ex B3A(18), [40]
[655] Ex B3A(18), [40]
[656] Ex B3A(18), [41]
[657] Ex B3A(18), [46]
[658] Ex B3C(7), pg. 24-29
[659] Ex B15(16), pg. 3
[660] Ex B3C(13), [25] & [26]
[661] Ex B3C(44), pg. 18

383. The following day, Mr. Ritchie was made aware of the fault by way of an 'Operations Report', which briefly outlines any issues with rides the previous day, and is sent via email to all Operations Management Team members and Maintenance Supervisors.[662]

Day of the Incident – 25 October 2016

384. Specific details as to the break downs that were experienced on the day of the tragic incident are outlined further under the heading, *Timeline of Events on 25th October 2016.*

385. By way of a brief summary**,** the Down Time Report for the TRRR on 25th October 2016,[663] shows that the ride broke down at 11:50 am and 1:09 pm. On both occasions, the reasons stated for the down time was, *'**South pump dropped out earth Fault**'.* The action taken by E&T staff that day was recorded as evacuating the guests and resetting the drive, following which the ride restarted.[664]

386. Arrangements had been made by Mr. Ritchie for Applied Electro to attend site to inspect the drives on Thursday, 27 October 2016.[665]

387. These records confirm that in the seven days prior to the fatal incident, there were five breakdowns of the TRRR, which were attributed to a failure of the south pump due to an 'Earth fault'. On each occasion, the drive was reset without any diagnosis of the cause or further investigation being conducted.

TIMELINE OF EVENTS ON 25 OCTOBER 2016

388. On 25 October 2016, the TRRR was operating with nine rafts in circulation and two Ride Operators.[666] This is the maximum number of rafts able to be utilised with a two person Operator model. Under this model, there is a No. 1 Operator and No. 2 operator, who have different responsibilities for the manning and command of the ride. The No. 1 Operator is responsible for the operation of the TRRR, as well as the actions of the Load Operator (No. 2 operator). At all times, one operator is positioned at the Main Control Panel with the other at the unload station. It is standard practice that the Operators switch roles at regular intervals, however, the responsibility for the ride remains that of the No. 1 Ride Operator, no matter where they are positioned.

389. At the time of the incident, Mr. Peter Nemeth (38 years of age) was performing the No. 1 Operator role, with Ms. Courtney Rhianne Williams (21 years of age) as the No. 2 Operator. Mr. Nemeth was an experienced Ride Operator having worked at Dreamworld for four years prior to the incident.[667] He had worked on the TRRR over the previous two years, initially as a No. 2 Operator for the first six months, and then as a No. 1 Operator.[668] Training records confirm that he was trained as a No. 2 Operator for the TRRR on 21 August 2015, which took one hour and 45 minutes.[669] He estimates that within the last year, he had

[662] Ex B3A(18), [43]
[663] Ex B15(1)
[664] Ex B15(1)
[665] Ex B3A(18), [49]
[666] Ex B1, pg. 13
[667] Ex B3A(1), [1]
[668] Ex B3A(1), [5]
[669] Ex C7(498)

operated the TRRR on 50 occasions.[670]

390. Due to his experience and tenure, Mr. Nemeth was also a safety representative for Ride Operators, and engaged in safety audits of rides, which included the TRRR, identifying any issues of concern to be rectified.[671] These audits were subsequently submitted to supervisors and the Safety Department for their consideration and action.[672] Mr. Nemeth was not provided with any specific training in order to conduct audits, except by the prior representative.[673] He participated in monthly meetings with the Safety Department and group inspections were conducted of different departments around the park.[674]

391. Whilst Ms. Williams had worked as a Ride Operator in both a part-time and full-time capacity at Dreamworld since July 2015,[675] the 25 October 2016 was the first day she was trained as the No. 2 Operator for the TRRR.[676] She had previously been trained as a Deckhand on the TRRR in December 2015.[677]

392. Ms. Amy Crisp and Ms. Sarah Cotter were the Relief Supervisors for the Ride Operators assigned that day.[678] Ms. Crisp was also performing the role of Instructing Operator and Induction Presenter.[679] As Supervisors, they were responsible for the general running of the park and attending all reported park problems, including ride operational issues, which were notified by the Security Control room.[680] Ms. Crisp commenced employment with Dreamworld as a Ride Operator in March 2011, and was employed as an Instructing Operator on a full-time basis since April 2012.[681] Prior to 25 October 2016, she had trained approximately 30 to 40 people in the varied roles at the TRRR, a majority of which were at the Level 2 or 1 roles.[682]

393. Mr. Wayne Cox was the E&T Supervisor rostered that day. Mr. Gordon and Mr. Matthew Robertson were the nominated Park Technicians. At the pre-work briefing that morning, Mr. Cox advised staff that if a ride had the same fault three times, on the third occasion then it needed to be escalated to a supervisor to investigate further.[683]

394. Having considered the witness statements, documentation and evidence provided during the inquest, the timeline of critical events leading up to the tragic incident on 25 October 2016, are as follows.

8:00 am: ***An E&T Pre-Service Inspection on TRRR***

395. At 8:00 am, Park Technician, Mr. Robertson, who was a Park Technician for the day, and Mechanical Tradesperson, Mr. Kamlesh Prasad carried out the E&T Pre-service Inspection on the TRRR.[684] The requisite checklist was completed,

[670] Ex B3A(3), pg. 10
[671] T2-96, lines 35-46; T2-98, lines 20-45
[672] T2-96, lines 35-47
[673] T2-97, lines 7-15
[674] T2-97, lines 10-15
[675] Ex C8(16), [7]
[676] Ex B3A(4), [10]
[677] Ex C8(16), [10]
[678] Ex B3A(11), [3]; Ex B3A(14), pg. 14
[679] Ex C6(46), [10]
[680] Ex B3A(20), [14]
[681] Ex C6(46), [15]
[682] Ex C6(46), [31] & [32]
[683] Ex B3C(9), [16]
[684] Ex B3A(16), [14-20]

which requires specific components of the ride to be inspected on a daily basis, including components of the north and south pumps, gates, draining of the rafts and raft tube inflation.[685] There were no issues with the checks conducted on that morning, and the service sheet was initialled as required.[686]

9:25 am: ***Courtney Williams commenced training***

396. Having been advised that morning by the rostering coordinator that she was to be trained on 'Rapids Load' at the TRRR, Ms. Williams attended the administration block at 9:25 am, where she met Ms. Crisp, who was scheduled to train her at the TRRR in the Number 2 Operator position.[687] Training was commenced in transit to the ride. According to Ms. Williams, Ms. Crisp spoke to her about the evacuation points and how to manoeuvre the rafts with her feet.[688]

397. Upon arriving at the ride, Ms. Crisp showed Ms. Williams the first Emergency Evacuation point for the TRRR, which is near the guest line up. A walk through of the ride was conducted, where components were pointed out relevant to the role.[689] Ms. Crisp highlighted the steel support beams around the ride, including those at the unload station, and advised her that the rafts would rest on these if the water drained out of the ride following a malfunction.[690] According to Ms. Crisp, whilst near the conveyor, she spoke to Ms. Williams about Code 6 situations on the ride, comparing it to the responsibilities of the Deckhand at the Log Ride, which would require her as the No. 2 Operator to attend the bottom of the conveyor and speak to guests.[691] The operation of the jacks at the unload area were also explained to Ms. Williams, as was the second emergency evacuation point near the guest line up.[692] Ms. Williams stated during the inquest that Ms. Crisp did not explain to her about the water level dropping and rafts resting on the supporting rails, however, she was generally aware that the water level needed to be monitored.[693]

398. Ms. Crisp then took Ms. Williams to the main Operator panel, where certain buttons were demonstrated, including the gate reset button (for a Code 6) and emergency stop button above the panel.[694] The release of the rafts and the holding gate were also explained and shown.[695] Ms. Crisp claimed in a response provided to OIR that she advised Ms. Williams that she could not dispatch two rafts together as the timer would prevent this from occurring. She claims that she explained to Ms. Williams that if two rafts were sent together, they could bump into one another resulting in a potential capsize.[696] Ms. Crisp also claims that she discussed the amp readings for the pump with Ms. Williams, as well as the need for her to stop operating if the reading was over 500, and have her No. 1 Operator attend so the operational issue could be dealt with.[697]

[685] Ex B3A(15), [35]; Ex B3A(16), [14], [15], [17] & [39]
[686] Ex B3A(15), [35]; Ex B3A(16), [18]
[687] Ex B3A(4), [14]
[688] Ex B3A(4), [16]; Ex B3A(14), pg. 14
[689] Ex B3A(4), [17]-[19]
[690] Ex B3A(4), [19]; Ex B3A(14), pg. 20
[691] Ex B3A(14), pg. 20 & 21; Ex C6(46), [35]-[38]
[692] Ex B3A(4), [19]-[21]
[693] T2-72, lines 30-47 & T2-74, lines 30-45
[694] Ex B3A(4), [24] & [25]; Ex C6(46), [84]-[90]
[695] Ex B3A(4), [24]
[696] Ex C6(46), [41]
[697] Ex C6(46), [52]

399. Although during her interview with the Police, Ms. Crisp seemed to acknowledge that she did not show Ms. Williams the start-up and shut down of the ride,[698] in her statement subsequently provided to OIR, she claimed that she '*showed Courtney how to shut down the conveyor as part of the emergency shut-down procedures.*'[699] She claims that she explained how to shut down the ride at the Main Control Panel, and also how to shut down the conveyor at the unload station.[700] Ms. Williams acknowledged during her interview with OIR and at the inquest that she had been shown four buttons as part of circular motion to shut down the ride on the main panel, which included two emergency stops.[701] However, Ms. Williams disagrees that she was shown the shutdown for the conveyor as part of the emergency shutdown procedure to be followed at the Main Control Panel.[702] She was simply shown the buttons to press during the procedure, and was not aware mechanically what those buttons did.[703]

400. Ms. Williams was also shown the unload area, where the respective yellow poles with buttons, which open the gates in the area, were explained.[704]

401. Ms. Williams's induction training went for approximately 15-20 minutes, until the No.1 Operator rostered that morning, Mr. Tim Williams arrived to open the ride.[705] Training records indicate that he had been trained as the No. 2 Operator for the TRRR on 26 September 2014.[706] He was not trained in the No. 1 Operator role until 5 October 2016 by Ms. Cotter.[707]

9:50 am: ***Operator start-up checks conducted***

402. Upon arrival, No. 1 Operator, Mr. Williams carried out the 'Operator Pre Start-up Checks', noting that Engineering Staff had signed the checklist.[708] He stated that during these checks, the amps for the South Pump fluctuated and at one point exceeded 500 amps, however, a visual alarm on the panel did not activate, which should occur.[709] He spoke to Ms. Crisp about the issue, and also sought advice from Relief Supervisor, Ms. Cotter.[710] Whilst speaking to Ms. Cotter, Mr. Williams noticed that the south pump amps dropped back down to 420, which was in line with the north pump.[711] Ms. Cotter contacted Mr. Francois De Villiers, who attended the TRRR and inspected the control panel. Mr. Williams was advised to keep an eye on the fault and to call E&T Department staff if the fault reoccurred or any further problems arose.[712]

403. Ms. Williams stayed with Mr. Williams whilst he turned the ride on, however, was also observing Ms. Crisp as she demonstrated how to run the queue line.[713] Ms. Williams recalls that she returned to the unload area and watched as the pumps began to operate. Ms. Crisp demonstrated how to stand at the unload area to

[698] Ex B3A(14), pg. 44
[699] Ex C6(46), [68]
[700] Ex C6(46), [68]
[701] T3-70 & 71, lines 1-15
[702] T3-72, lines 1-10
[703] T2-72, lines 20-30
[704] Ex B3A(4), [27] & [28]
[705] Ex B3A(4), [29]; Ex B3A(11), [14]
[706] Ex C7(533)
[707] Ex C7(530)
[708] Ex B3A(11), [15] & [16]
[709] Ex B3A(11), [28] & [29]; T4-46, lines 5-35
[710] Ex B3A(11), [30]-[32]; Ex B3A(14), pg. 43
[711] Ex B3A(11), [32]
[712] Ex B3A(11), [35]
[713] Ex B3A(4), [30]; Ex B3A(14), pg. 35

ensure the conveyor was being monitored, and which buttons on the poles needed to be pressed at certain times.[714] Ms. Crisp demonstrated the first practice run, allowing Ms. Williams to undertake the second.[715] Ms. Crisp had to correct Ms. Williams to ensure her body was facing the conveyor and to prevent her from straining whilst guiding the raft into position.[716] She states that she impressed upon Ms. Williams the importance of not having her back to the conveyor at the unload area.[717] Ms. Williams undertook approximately two to three test runs before guests were traveling on the ride.[718]

10:05 am: ***TRRR opens to the public***

404. The ride was opened to the public by the operators. Mr. Williams was stationed at the Main Control Panel loading guests onto the ride, with Ms. Williams (still being trained by Ms. Crisp) at the unload area, and performing the role of unloading guests.[719] Ms. Crisp performed the first few unloads of guests, whilst Ms. Williams watched, before seeing whether she was comfortable to undertake the next round.[720] Ms. Williams continued to perform the unloading of guests under Ms. Crisp's watch and guidance.[721]

405. Ms. Crisp states that she advised Ms. Williams as to the water level, and referred her to the markings on the wall. She stated, *'As long as the rafts are bobbling around you know that your water level is enough. As soon as they're not moving or as soon as you notice that level there drop that's how you know your water level is right'.*[722]

406. According to Ms. Williams, whilst she was at the Main Control Panel with Ms. Crisp, the yellow case enclosing the E-Stop button at the unload area was pointed out from a distance, which at the time had Mr. Williams drink bottle on it.[723] According to Ms. Williams, Ms. Crisp stated that this was the E-Stop button for the unload side, and words to the effect of *'but don't worry about it, no one ever uses it'.*[724] According to Ms. Crisp, she pointed out the E-Stop button, and advised Ms. Williams that it would stop the conveyor and a pump.[725] She claims that she also stated that *'the only situation you'd use that in is, say you were unloading and Tim fell in, he obviously can't shut down the ride on himself, you can hit that to start the process rolling.'*[726] In her subsequent statement to OIR, Ms. Crisp states that she told Ms. Williams that she could press the E-Stop if she was at the unload area and there was an emergency and the ride needed to be stopped to '*get the shutdown started'*, however, she needed to alert the No. 1 Operator.[727] She claims that she specifically mentioned the scenario of someone standing on the conveyor or a raft slipping down in the context of explaining what an emergency situation may be.[728]

[714] Ex B3A(4), [32]
[715] Ex B3A(4), [33]
[716] Ex B3A(4), [34]; Ex B3A(14), pg. 38
[717] Ex B3A(14), pg. 38 & 41
[718] Ex B3A(4), [37]
[719] Ex B3A(11), [36]
[720] Ex B3A(4), [38]-[41]
[721] Ex B3A(4), [41]
[722] Ex B3A(14), pg. 41
[723] Ex C8(16), [77]; Ex B3A(14), pg. 47
[724] Ex C8(16), [77]
[725] Ex B3A(14), pg. 47
[726] Ex B3A(14), pg. 47
[727] Ex C6(46), [95] & [96]
[728] Ex C6(46), [96]

407. At inquest, Ms. Williams stated that Ms. Crisp did not tell her that the E-Stop button at the unload area stopped the conveyor.[729] She claims that this would have been important information for her to be told.[730]

10:30 am: ***Operator positions swapped***

408. Mr. Williams swapped positions with Ms. Williams (who was still accompanied by Ms. Crisp), so that she could be trained at the Main Control Panel in the loading area.[731] Ms. Williams describes Ms. Crisp as loading the first couple of sets of guests onto rafts to allow her to observe.[732] In between guests boarding the rafts, Ms. Crisp is said to have taken Ms. Williams to the control panel to demonstrate, which buttons to press and not to press.[733] Ms. Williams subsequently performed the loading of guests onto the rafts under Ms. Crisp's guidance and instruction as to each step to be undertaken.[734]

11:15 am: ***Ms. Williams completed training***

409. Ms. Williams was deemed to have completed her training as the No. 2 Operator at the TRRR by Ms. Crisp, and both signed the requisite training documents.[735] Ms. Williams recalls that at this time, she read through documents in the folder kept at the ride, including the Operator Procedure Manual and memorandums.[736] According to Ms. Crisp, she pointed out the memorandum relating to the E-Stop.[737] This training was also considered to be a concurrent retraining of the Deckhand role (No. 3) at the TRRR.[738]

410. Ms. Crisp then left the TRRR with Ms. Williams' manning the Main Control Panel. The total time Ms. Williams was provided with training in the No.2 Operator role at the TRRR was 1 ½ hours.

11:30 am: ***Operator change***

411. At this time, Ms. Chloe Brix arrived at the TRRR to relieve Ms. Williams at the Main Control Panel, whilst Mr. Williams remained at the unload platform.[739] Ms. Brix was a Senior Ride Operator, who commenced working at Dreamworld in December 2011.[740] She was first trained as the No. 2 Operator on the TRRR in 2013[741], and in the No. 1 Operator position on 17 September 2015.[742] She recalls that prior to attending the TRRR, she had spoken to Ms. Crisp, who advised her that Ms. Williams had been trained in the No. 2 Operator position that morning, and was performing well.[743] She requested that Ms. Brix check to see whether Ms. Williams had any questions when she attended the ride.[744]

[729] T2-72, lines 7-25
[730] T2-76, lines 35-40
[731] Ex B3A(4), [42]; Ex B3A(11), [37]
[732] Ex B3A(4), [42]
[733] Ex B3A(4), [43]
[734] Ex B3A(4), [44]
[735] Ex B3A(4), [47] & [48]; Ex B3A(14), pg. 51
[736] Ex B3A(5), pg. 8
[737] Ex B3A(14), pg. 49
[738] Ex C6(46), [81] & [82]
[739] Ex B3A(11), [39]; Ex B3A(12), pg. 22
[740] Ex B3A(12), pg. 5
[741] Ex C7(542)
[742] Ex C7(389)
[743] T4-101, lines 5-30
[744] T4-101, lines 10-30

11:50 am: ***1st pump breakdown – South pump failed - Code 6***

412. Whilst Ms. Brix was at the Main Control Panel performing the No. 2 Operator position, she noticed that the water level had dropped. She called to Mr. Williams at the unload area. At this time, a raft had just exited the conveyor and entered the first jack area. Mr. Williams asked Ms. Brix to wait whilst he managed the raft and passengers.[745] He then noticed that the raft did not move when he pressed the first jack button as it was sitting on the rails, and soon realised that the south pump was off.[746] After telling the patrons in the raft to stay seated, he attended the Main Control Panel and commenced the shutdown procedure for the ride, which included closing the emergency jack, turning off the conveyor and pressing the emergency stop for one pump.[747] Mr. Williams then called Control to report a Code 6.[748] Ms. Brix attended the bottom of the conveyor to tell the passengers about the issue and to ask them to remain seated.[749]

413. Mr. Mark Gordon and Mr. Robertson attended the ride to inspect the issue.[750] Mr. Robertson attempted to reset the south pump at the Main Control Panel, however, this was not successful.[751] He subsequently contacted the Electrical Department to request assistance.[752] Electrician, Mr. Frank De Villiers attended the control room where the pump drives are located.[753] He noticed that the drive for the South Pump had tripped and there was an alarm on it, which read '<u>Alarm 14 Earth Fault</u>'.[754] He contacted Mr. Robertson at the Main Control Panel to advise him that he was going to try and reset the drive by pressing the reset button on the keypad where the fault was displayed.[755] This did not work, so Mr. De Villiers decided to turn the south drive off. After allowing the drive to power down, he turned it back on, and this cleared the fault.[756] He then requested that Mr. Robertson attempt to reset the pumps once again at the Main Control Panel, which was successful.

414. Mr. Robertson requested that Mr. De Villiers show himself and Mr. Gordon how to re-set the south pump, should the fault occur again, which he did by demonstrating the main switch (large lever) in the control room, which powered the pump motor.[757] During the inquest, Mr. Robertson claimed that he made such a request as the Electrical team were '*distracted that day'* by other electrical issues within the Park that needed to be resolved.[758] Accordingly, the timeframe taken to evacuate guests had been prolonged awaiting electrical assistance, which had caused some upset. Mr. Robertson thought that if he could reset the pump himself, this would speed up any subsequent attendances.[759]

415. Ms. Cotter and Ms. Crisp also attended the ride and made sure that the required switches at the Main Control Panel were turned off and the ride was locked

[745] Ex B3A(11), [41]
[746] Ex B3A(11), [42] & [43]; Ex C7(18)(a), pg. 32; T-4-48
[747] Ex B3A(11), [40], [44] & [45]
[748] Ex B3A(11), [46]
[749] Ex B3A(11), [47]
[750] Ex B3A(16), [24]; Ex B3C(9), [24] & [25]
[751] Ex B3A(16), [24]
[752] Ex B3A(16), [24]
[753] Ex B3A(16), [24]; Ex B3C(35), [24] & [25]
[754] Ex B3C(35), [25]
[755] Ex B3C(35), [26]
[756] Ex B3C(35), [27]
[757] Ex B3A(16), [24]
[758] T5-33, lines 3-30
[759] T5-33, lines 3-30

out.[760] Whilst the Engineering and Electrical staff were attempting to rectify the issue, a decision was made to evacuate the guests from the ride as some were getting impatient with rafts stranded at various places around the watercourse.[761]

416. Once the pumps were reset and the ride restarted successfully, Ms. Cotter handed control of the ride back to Mr. Williams.[762]

417. At a later time that day, Mr. Williams, whilst manning the Giant Drop, recalls hearing Ms. Cotter speaking to the E&T staff, whereby it was stated that if there was another failure of the pump, the ride would be closed for the day.[763] According to Ms. Cotter the issue with the south pump had been '*happening frequently over the last week*' following which the water level drops '*dramatically*'.[764] The consequence of this has been that the north pump ceases to operate, which causes the ride to lose almost all of the water.[765]

418. Mr. De Villiers subsequently had a conversation with Mr. Ritchie later that day about the pump tripping, where he states that it was decided that the South Motor would be megger(ed) on the following day before Dreamworld opened to the public.[766] According to Mr. Ritchie, he spoke to Mr. De Villiers briefly about what may have been causing the issue and formed the belief that it was an intermittent fault in the drive and not with the motor.[767] He advised Mr. De Villiers that the drive specialists were attending to inspect the issue on Thursday.

12:21 pm: ***TRRR reopened to the public***

419. The TRRR was reopened to the public, with Ms. Williams returning from her lunch break, relieving Mr. Williams. He did not return to the TRRR that day.[768]

420. Ms. Williams recalls that Mr. Williams explained that there had been an increase in the amps reading for the pumps whilst she was on lunch and the ride had to be shut down.[769]

1:09 pm: ***2nd pump breakdown – South pump failed – Code 6***

421. Whilst Ms. Williams was stationed at the Main Control Panel, Ms. Brix, who was at the unload station, approached her and advised that the south pump light was flashing, which means that one of the two pumps had faulted.[770] As the No. 1 Operator, Ms. Brix instructed Ms. Williams to stand at the end of the conveyor whilst she undertook the shutdown procedure.[771] During her field interview, Ms. Brix stated that Ms. Williams was not allowed to shut down the ride even though she was stationed at the Main Control Panel at the time, as she remained the No. 2 Operator for the ride.[772] Ms. Williams recalls that during the time the ride shut down, the water level had dropped and completely drained out of the pool,

[760] Ex B3A(20), [26]-[28]; Ex B3A(20), [32] & [33]
[761] Ex B3A(11), [53]; Ex C7(18)(a), pg. 36; Ex B3A(20), [42]-[45]
[762] Ex B3A(20), [46] & [47]; Ex B3A(16), [25]
[763] Ex B3A(11), [58]; Ex C7(18)(a), pg. 45; T4-50
[764] Ex B3A(20), [31]
[765] Ex B3A(20), [31]
[766] Ex B3C(35), [31]
[767] Ex B3A(18), [25] & [26]
[768] Ex B3A(11), [54] & [56]
[769] Ex B3A(4), [50] & [51]
[770] Ex B3A(4), [54]; Ex B3A(12), pg. 24 & 25
[771] Ex B3A(4), [55]
[772] Ex B3A(12), pg. 28

which left the rafts resting on the support railings.[773]

422. Mr. Gordon and Mr. Robertson attended the TRRR once again.[774] Whilst Mr. Robertson went to the Main Control Panel, Mr. Gordon attended the control room and reset the pump drive for the south pump motor, as was demonstrated by Mr. De Villiers.[775] Mr. Robertson subsequently successfully reset the south pump at the control panel.[776] They assisted to return rafts to the dispatch area, before evacuating guests.

423. Ms. Cotter also attended to ensure that the ride was operating correctly, before handing back control of the ride to Ms. Brix.[777] Ms. Cotter recalls saying to Mr. Robertson, *'What are we doing about this pump problem. This is ridiculous'.*[778] He is said to have advised her that *'It's our procedure that the alarm has to occur three times before the ride is shut down. If another one happens we will close the ride for the day. The ride is fine now to run.'*[779] It does not appear that the second fault of the south pump was escalated to an E&T Department Supervisor.[780]

1:25 pm: ***TRRR was reopened to the public***

424. The ride was reopened to the public with Ms. Brix stationed at the Main Control Panel and Ms. Williams at the unload station.[781] Shortly thereafter, Mr. Peter Nemeth arrived at the TRRR to relieve Ms. Brix as the No. 1 Operator for the afternoon. He was stationed at the Main Control Panel, with Ms. Williams remaining at the unload area.[782]

425. As Mr. Nemeth arrived at the TRRR, Ms. Cotter told him that there had been water level issues earlier in the day, as the water pump had stopped on two occasions.[783] He was aware that there were two pumps that serviced the ride, which in the event one failed, the water level of the ride dropped dramatically.[784] In such circumstances, the ride needed to be shut down.[785] Ms. Cotter advised Mr. Nemeth that if there was a further issue, the ride would have to be closed.[786]

2:00 pm: ***Raft 6 loaded and released***

426. Raft 6 carrying Mr. Stephen Anthorpe, Ms. Bree Dedini, Arlen Anthorpe (one year of age), Chase Anthorpe (4 years of age), Ms. Michelle Farah and Dakota Marks (4 years of age), was released onto the water course by Mr. Nemeth.

427. Ms. Williams states that at around this time, she had intended to swap positions with Mr. Nemeth, who was still at the Main Control Panel.[787] She unsuccessfully attempted to get his attention, as she did not see a raft coming down the conveyor. When she turned around, she observed a raft coming down the

[773] Ex B3A(4), [55]
[774] Ex B3A(16), [28]
[775] Ex B3A(16), [28]; Ex B3C(9), [35]
[776] Ex B3A(16), [28]
[777] Ex B3A(20), [52]-[68]
[778] Ex B3A(20), [66]
[779] Ex B3A(20), [67]; T5-35, 36, lines 1-25
[780] Ex B3C(6), [16]
[781] Ex B3A(4), [58]
[782] Ex B3A(4), [6]
[783] Ex B3A(1), [7]; Ex B3A(21), pg. 33 & 34; T2-58, lines 5-25
[784] Ex B3A(1), [7]
[785] Ex B3A(2), pg. 25
[786] Ex B3A(1), [7]; T2-58, lines 20-25
[787] Ex B3A(4), [61]

conveyor, which she brought into the unloading area to allow the patrons to disembark.[788]

2:01 pm: ***Raft 5 loaded and released***

428. Raft 5 carrying Ms. Goodchild, Ebony Turner, Mr. Dorsett, Ms. Low, Keiran Low and Mr. Araghi was loaded and released into the watercourse by Mr. Nemeth.

429. Between 2:01:28 pm and 2:03:35 pm, Raft 6 can be seen on CCTV footage provided by five cameras situated around the watercourse, traveling the ride without incident. At this time, the raft is picked up by the conveyor. Similarly, between 2:02:12 pm and 2:03:53 pm, Raft 5 can be seen traveling the watercourse without incident.

2:03:50 pm: ***CCTV captures south pump stopping***

430. Camera 14, which is positioned on a southern maintenance shed and provided a view over the south pump inlet and the descending end of the conveyor, captured the south pump ceasing to work, with water visibly flowing back into the pump outlet.

2:03:53 pm: ***Raft 6 descends the conveyor belt***

2:04:10 pm: ***Raft 6 becomes stranded on the support rails***

431. Camera 14 of the CCTV footages captures Raft 6 descending the conveyor before becoming stranded on the support rails near the unload station. Ms. Williams claims that upon seeing this, she pressed the green button on the first pole in the unload area to try and open the first gate, however, this did not assist.[789] Knowing that she needed to notify the No. 1 Operator who was in control of the ride, she claims that she turned towards the main control booth and tried to get Mr. Nemeth's attention, as she was aware that this was a Code 6 situation.[790] She states that at the time, he had his back to her and was loading people into a raft. Ms. Williams turned back to the guests in the stranded raft and advised them that there would be a short delay.[791] A photograph of the guests being loaded into the raft where Mr. Nemeth was stationed was time stamped as 2:04 pm. It is evident from the photograph that the water level in the watercourse is significantly reduced at this time.[792]

432. According to Mr. Nemeth, as he was viewing the loading area where guests were boarding the rafts, he noticed that the water level was going down dramatically, and he could see the support railings, which were normally under water.[793] He notes that *'it only takes a few seconds for the water level to go down enough for the rafts to sit on the rails',* following which the rafts cannot be moved.[794] At the time, Mr. Nemeth recalls that one raft was ready to be released onto the watercourse, with a further behind it that had been loaded with guests. At the unload area, he noticed that there were two rafts waiting to be unloaded, one of which had come off the conveyor and was sitting on the supporting railings, as

[788] Ex B3A(4), [64]
[789] Ex B3A(4), [65]; Ex C8 (16), [94]; T4-5, 6 & 7
[790] Ex B3A(4), [65]; T4-5-7
[791] Ex B3A(4), [65]
[792] Ex B1, pg. 18
[793] Ex B3A(1), [10]; Ex B3A(2), pg. 39; T2-59, lines 5-17
[794] Ex B3A(1), [10]

the water level had reduced.[795]

433. According to Mr. Nemeth, he told the guests he had loaded into the raft that they would need to disembark as the ride could not operate.[796] He assisted the guests to exit the raft.[797] Mr. Nemeth acknowledges that this was a Code 6 situation, and he would need to shut down the ride and notify his Supervisor and the Control Room.[798]

434. According to guests on the raft Mr. Nemeth was loading, it took around 40 seconds for all of the guests to be seated.[799] A photograph of the group was taken, however, the raft did not move. One of the occupants recalls seeing Mr. Nemeth turn to the control panel, which was about a metre away, for around 10 seconds, before advising them that they needed to disembark.[800] It was thought that he may have been using a two-way radio at this time.[801] Mr. Nemeth is said to have mentioned that the water level was too low, and an engineer would need to come and reset the ride.[802]

2:04:22 pm: ***Raft 5 is picked up by the conveyor***

435. Camera 9 at this time captures Raft 5 being picked up by the conveyor. During Mr. Nemeth's field interview, he stated that at this time he had realised that Raft 6 was stranded on the support rails at the unload area, however, didn't see another raft on the conveyor.[803] He did, however, see that the conveyor was still operating. Mr. Nemeth claims he commenced the procedure for a Code 6, however, could not recall if he had called first or commenced the ride shutdown.[804]

2:04:50 pm: ***Raft 5 begins to descend the conveyor***

436. Camera 14 captured Raft 5 as it began to descend the conveyor towards where Raft 6 was stranded on the metal support railings. Mr. Nemeth stated that Raft 5 appeared on the conveyor all of a sudden and he could see that it was getting close to Raft 6. He claims that he pressed the red conveyor stop button a few times (maybe two or three times) in a panic, however, the conveyor did not stop.[805] During his first field interview, Mr. Nemeth initially claims that when he first saw Raft 5 it was just 'over the top' of the conveyor.[806] He then demonstrates where the raft was at the time, and claims that it was '*not far away from the end of the conveyor*'.[807] During the inquest, Mr. Nemeth clarified that there was between 5 to 10 metres between the rafts when he first saw Raft 5 on the conveyor.[808]

[795] Ex B3A(1), [10]
[796] Ex B3A(3), pg. 23
[797] Ex B3A(3), pg. 28
[798] Ex B3A(3), pg. 24 & 25
[799] Ex B3B(7), [11] & [12]
[800] Ex B3B(7), [13]-[15]
[801] Ex B3B(7), [15]
[802] Ex B3B(9), [16] & [17]
[803] Ex B3A(2), pg. 41 & 42
[804] Ex B3A(2), pg. 41
[805] Ex B3A(1), [11]; Ex B3A(2), pg. 42 & 43; T2-60, lines 14-20
[806] Ex B3A(2), pg. 44; T2-6-, lines 1-15
[807] Ex B3A(2), pg. 46
[808] T2-60, lines 5-13

437. According to Mr. Nemeth, the collision then occurred, which is when it '*became really serious'*, and he used the phone to call 222, which is an emergency call.[809] He claims after he hung up the telephone, he then pushed an audible alarm, which is intended to advise all of the departments in the Theme Park to attend a ride urgently.[810]

438. Ms. Williams claims that whilst she had her back to the conveyor attempting to communicate with Mr. Nemeth about the situation, she saw that his '*facial expressions just completely dropped*'.[811] She turned around and saw that a raft was traveling down the conveyor, and would collide with the raft stranded on the metal support rails.[812]She claims that she didn't move from the unload area, as she wasn't sure if it was a Code 6 and Mr. Nemeth wanted her to attend the deck at the bottom of the conveyor, as she had previously done during the Code 6 earlier that day.[813] In a later statement, Ms. Williams further states that she saw Mr. Nemeth was looking over in her direction at the time, and she had assumed that he was counting the rafts so that he could inform control when he called, as is required of the No. 1 Operator.[814] Mr. Nemeth acknowledges in a field interview with OIR that he made eye contact with Ms. Williams before he saw the raft was approaching the other stranded on the railings.[815] To the best of his recollection, he believes that he had tried to stop the conveyor before he made eye contact with Ms. Williams.[816] During the inquest, Mr. Nemeth acknowledged that whilst he was looking at Ms. Williams prior to the collision, he never directed or told her to activate the E-Stop at the unload platform.[817]

2:05:03 pm: ***Raft 5 first contact with Raft 6***

439. Camera 14 captured Raft 5 as it first collides with Raft 6 at the end of the conveyor near the unload platform.

2:05:06 pm: ***Raft 5 and Raft 6 pivot upwards***

440. Camera 14 captures Raft 5 as it continues to be propelled forward by the moving conveyor belt, causing both rafts to pivot upwards.

2:05:07 pm: ***Raft 5 aligned with the conveyor head and support rails***

441. Raft 5 can be seen on the CCTV to continue into a vertical position with Raft 6 seen to fall back into a horizontal position resting on the rails. Raft 5 is then shaken violently, as the conveyor belt continues to rotate.

442. Ms. Williams claims that during this time, Mr. Nemeth appeared to have an empty expression, and he was just staring.[818] She ran to the conveyor to assist.[819]

2:05:11 pm: ***Ms. Goodchild is seen to fall from the bottom left hand side of Raft 5***

[809] Ex B3A(2), pg. 43
[810] Ex B3A(2), pg. 43
[811] Ex B3A(4), [68]
[812] Ex B3A(4), [70]
[813] Ex B3A(4), [70]; Ex C8(16), [89]
[814] Ex C8(16), [86]
[815] Ex B3A(3), pg. 29 & 30
[816] Ex B3A(3), pg. 30 & 31
[817] T3-56, lines 37-47 & T3-57, lines 1-26
[818] Ex B3A(4), [73]
[819] Ex B3A(4), [75] & [76]

2:05:13 pm: ***Mr. Dorsett is seen to fall from the top of Raft 5***

2:05:14 pm: ***The conveyor is seen on the CCTV to start to slow down speed***

2:04:22 pm: ***The conveyor is seen on the CCTV to cease movement***

2:05:27 pm: ***Ebony Turner is observed to climb out of Raft 5 onto a concrete platform***

2:05:35 pm: ***Kieran Low is observed to climb out of Raft 5 onto an employee walkway***

Immediate Response to the Tragic Incident

443. While the recollection provided by Mr. Nemeth is somewhat conflicting, it appears that immediately following the collision of the rafts, he remained at the Main Control Panel and rang '222' speaking to Security Officer, Mr. Nigel Irwin. Mr. Irwin was the sole staff member rostered to work in the control room that day. His general responsibility was communications throughout the park by way of three different hard wired radios and monitoring CCTV footage.[820]

444. Mr. Nemeth advised Mr. Irwin that there was a 'Code 222 Blue' at the TRRR, and that there was a raft on the conveyor.[821] Mr. Irwin initiated this call over the two-way radio, however, upgraded the incident to a 'Code 222 Grey' once he had viewed the CCTV footage, and noticed that a raft was in a vertical position.[822] This Code alerts all responding staff that there is machinery involved in the medical emergency and ride shut down.[823] Mr. Irwin noted that the River Rapid alarm had not sounded, which is meant to occur over every two way radio in the Park when the pumps fail.[824] This is a manual alarm at the control panel at the TRRR, which is activated by the Ride Operator.[825]

445. Ms. Williams, along with occupants of Raft 6 and other patrons in the vicinity of the incident, immediately helped to evacuate uninjured guests from the area. Ms. Williams crossed the conveyor to assist Kieran, who was seated next to the upturned raft, to usher him away from the scene.[826] Mr. Danny Haber, who was queuing up for the ride, assisted Kieran to cross the conveyor belt so that he could be removed from the area.[827]

446. Mr. Steven Anthorpe, who was in Raft 6 with his family, secured his children and immediately entered the watercourse via the conveyor to try and assist Ms. Goodchild.[828] He saw that there was a female and male trapped in the raft.[829] Other patrons in the area provided him with assistance, including Mr. Haber. Mr. Anthorpe immediately commenced CPR on Ms. Goodchild, and was joined soon thereafter by Dreamworld First Aid Officers, including Mr. John Clark.[830] Attempts were made to remove Ms. Goodchild from the watercourse using a nearby

[820] Ex B3A(13), [14] & [15]
[821] Ex B3A(13), [24]
[822] Ex B3A(13), [29] & [30]
[823] T12-61, lines 30-40
[824] T12-62, lines 8-20
[825] T12-62, lines 23-30
[826] Ex B3A(4), [77] & [78]
[827] Ex B3B(1), [xxi]
[828] Ex B3A(9), [15]-[19]
[829] Ex B3A(9), [19]
[830] Ex B3C(34)

garden hose, however, these were unsuccessful.[831] As the water receded, Ms. Goodchild was dragged onto a hard flat surface, so that further resuscitation efforts could be carried out.[832] By this time, she had ceased breathing. Chest compressions were commenced, and Mr. Clark was provided with his first response bag.[833] Further life saving measures, including mouth to mouth resuscitation, were carried out prior to Queensland Ambulance Service (QAS) arrival at the scene.[834]

447. At 2:09 pm, other Dreamworld employees from all over the Park arrived on the scene and attempted to assist with the evacuation area and also securing the rafts to the conveyor.

448. A number of calls were made immediately to emergency services, the first being at 2:10 pm by Mr. Irwin.[835] The QAS contacted QPS at 2:16 pm, who arrived on the scene within six minutes. At 2:17 pm, a QAS call taker provided instructions regarding the treatment of patients. It is clear from this phone conversation that only two patients, Ms. Goodchild and Mr. Dorsett had been located at this time.

449. A short time after QAS arrived on the scene, Mr. Irwin was contacted by Mr. Margetts via the two way radio.[836] He requested that Mr. Irwin switch to Channel six, which is used solely by senior management. He asked questions as to how many people were in the raft. Mr. Irwin viewed the CCTV footage and subsequently advised Mr. Margetts that there were six people in the raft, however, two children had appeared to have exited the raft safely.[837]

450. The first responding QAS officers arrived at the scene at 2:22 pm. Following this time, a further 9 QAS officers attended the scene to provide medical assistance to all of the patients involved in the tragic incident. QAS officers conducted rapid assessments of Ms. Low and Mr. Dorsett, who were trapped in the mechanism of the conveyor. Life extinct was declared shortly thereafter for Ms. Low at 2:25 pm and Mr. Dorsett at 2:27 pm. Mr. Araghi, who was still receiving CPR at the time, was also subject to a rapid discontinuation assessment, and subsequently declared life extinct at 2:33 pm. During this time, Ms. Goodchild continued to receive CPR, however, despite extensive resuscitation measures, she was unable to be revived, and life extinct was declared at 2:45 pm.

451. The actions of patrons and some Dreamworld staff immediately following the event, in what was extremely traumatic and difficult circumstances, was truly remarkable and should be commended.

Further Evidence from Ms. Williams

452. During the course of the coronial investigation, Ms. Williams provided a number of statements and participated in a walkthrough of the scene with OIR investigators. In addition, Ms. Williams gave evidence during the proceedings over the course of two days.

[831] Ex B3C(34), [37]
[832] Ex B3C(34), [38]; Ex B3B(1), [xxiii]
[833] Ex B3C(34), [43]
[834] Ex B3C(34), [44] & [45]
[835] Ex B3A(13), [38]-[46]
[836] Ex B3A(13), [53]
[837] Ex B3A(13), [54]-[58]

453. Ms. Williams claims that she was provided with training in respect of some hazards related to the ride, which included monitoring patron's movements in rafts by way of the CCTV, and how to progress a raft with her foot whilst in the load and unload bays.[838] She was also advised about the water pumps green light on the control panel and the amp readings, as the ride would stop if either pump failed.[839] Ms. Williams was also made aware of a drop in water in the event that one of the pumps failed, however, thought the ride would stop automatically.[840] She knew that there were no water level indicators on the ride, and Operators were required to keep an eye on the water itself.[841] In terms of considering the written components of the 18 page Operator Procedure Manual, Ms. Williams stated during the inquest that whilst she was given the opportunity to consider the content at the end of her training session, it was only 'briefly' and she was required to digest and comprehend the sections herself.[842]

454. As the No. 2 Operator for the TRRR, Ms. Williams was of the understanding that it was No. 1 Operator's responsibility to take control of any Code 6 issues on the ride, and her role would be to attend the deck under the bridge immediately prior to the conveyor belt.[843] Whilst she was shown some details as to the shutdown controls, it was her understanding that if she was '*comfortable and confident doing so'*, then she could undertake the four button shutdown.[844] Given she had not been trained in the No. 1 Operator position, and had only received training for the No. 2 Operator responsibilities that morning, she was understandably not *'100 % comfortable with being the one to shut-down the ride'*.[845]

455. In support of Ms. Williams understanding as to the role of the No. 2 Operator in a Code 6 situation, Ms. Crisp stated during her field interview that in relation to shut down procedures and reasons this may occur, it was for the No. 1 Operator to know, which is what she advised Ms. Williams.[846] Furthermore, Ms. Crisp noted that whist showing Ms. Williams the Main Control Panel she '*was a bit overwhelmed*' as she knew she was going to have to start moving the rafts, so they stayed at the unload area until she was comfortable.[847] In relation to the Operator Procedure Manual for the No. 1 Operator, Ms. Williams stated during the inquest that whilst she had skimmed this manual present at the ride, she didn't take much notice of it as she was being trained in the No. 2 Operator role only.[848]

456. It was Ms. Williams' understanding that as the No. 1 Operator, Mr. Nemeth would shut down the ride, and she would be required to attend the deck near the conveyor.[849]

457. In relation to the E-Stop button, Ms. Williams stated that '*in the heat of the moment'* she did not consider pressing the button, for the following reasons:[850]

    a. It was her first day in the No. 2 Operator role at the ride and there 'was

[838] Ex C8(16), [20] & [21]
[839] Ex C8(16), [27]
[840] Ex C8(16), [27] & [28]
[841] Ex C8(16), [29]
[842] T4-41, lines 5-38
[843] Ex C8(16), [36]
[844] Ex C8(16), [43]
[845] Ex C8(16), [43]
[846] Ex B3A(14), pg. 34
[847] Ex B3A(14), pg. 36
[848] T3-67, lines 40-48
[849] Ex C8(16), [88]
[850] Ex C8(16), [103]

lots to be thinking about all at once';

b. When the incident occurred, and the raft had tipped, she was focused on the events that were unfolding in front of her;

c. It was her understanding that at all times the No. 1 Operator was in control of the Main Control Panel. Had she been directed to press the E-Stop she would have pressed it.

d. Given Ms. Crisp's comments to her about the E-Stop, it seemed that the button was less important than the controls at the Main Control Panel; and

e. Whilst she had a general understanding that E-Stop buttons for different theme-park rides stopped the ride, she was not aware that the E-Stop at the TRRR stopped the conveyor, or another aspect of the ride.

458. Ms. Williams noted that she received no training as to what to do if a raft came down the conveyor when a Code 6 occurred.[851]

Further Evidence of Mr. Nemeth

459. Mr. Nemeth was aware that the No. 1 Operator for the TRRR was '*responsible for the ride*', which included a supervisory role over the No. 2 Operator.[852] He received training in the No. 1 Operator position around a 1 ½ years before the incident, by Ms. Crisp.[853] This training involved a full day operating the ride whilst being simultaneously trained, as well as opening and closing the ride with the trainer the following day.[854] He recalls that the Operating Procedure Manual was used during the training, as he was taken through each step and then able to read it in its entirety at the conclusion of the training session.[855] Whilst various hazards, such as the pumps or conveyor stopping, were brought to his attention, the prospects of rafts colliding were not canvassed.[856]

460. At inquest, Mr. Nemeth noted that he had found it difficult to communicate with the unload Operator whilst at the Main Control Panel, however, had never raised this issue with the Supervisors.[857]

461. In relation to the E-Stop at the unload area, Mr. Nemeth stated during his field interview that he was aware that it could stop the conveyor, however, was of the understanding following training that *'it should only be used if the – if the emergency stop is not accessible on the control panel'.*[858] During a field interview, Mr. Nemeth was asked about the various memorandums relating to the TRRR, particularly that of the 18 October 2016 relating to the E-Stop. It was his understanding that this memorandum was to inform staff as to the use of the E-Stop, which was to be pressed in an emergency if that Main Control Panel could not be accessed.[859]

[851] Ex C8(16), [111]
[852] Ex B3A(2), pg. 5; Ex B3A(3), pg. 18
[853] Ex B3A(3), pg. 6
[854] Ex B3A(3), pg. 6
[855] Ex B3A(3), pg. 7 & 8
[856] Ex B3A(3), pg. 9
[857] T2-92, lines 29-41
[858] Ex B3A(2), pg. 8
[859] Ex B3A(3), pg. 15

462. With respect to the water level, Mr. Nemeth noted that there were no official markers around the trough of the ride, rather Operators used the discoloration marker around the edge to gauge whether the water level had dropped, and may be too low.[860]

463. During training, various Code 6 scenarios were considered, including one or both pumps stopping.[861] It was his understanding that a Code 6 applied to circumstances when the ride was not fully operational and unsafe to operate.[862]

464. In relation to the pump breaking down, Mr. Nemeth stated that he was aware that there had been an issue with the south pump turning off, which had been happening over a number of days.[863] This seemed to be common knowledge amongst Ride Operators.[864]

465. Mr. Nemeth was not aware of the Breakdown Procedure, which was applicable to staff in the E&T Department as to ride closures.[865]

466. Mr. Nemeth stated that he had pressed the conveyor stop button several times on previous occasions whilst operating the ride, and had never had an issue with it working before.[866] He stated during the inquest that he had previously been in situations on the TRRR where the rafts had been resting on the rails due to a drop in the water level, and on these occasions, he had turned to the Main Control Panel, and carried out the shutdown procedure per the Operators Procedure Manual.[867]

Discussion with QPS, OIR & Dreamworld Management on 25 October 2016

467. Commencing at 5:27 pm on 25 October 2016, shortly following the tragic incident, a number of recorded discussions took place on-site at Dreamworld with the following participants:

- Senior Constable Paul Joyce – QPS, Forensic Crash Unit
- Mr. Michael Chan – OIR, Chief Safety Engineer
- Mr. Ian Stewart – OIR, Principal Inspector
- Mr. Craig Davidson – CEO, Dreamworld
- Mr. Chris Deaves – General Manager, Engineering, Dreamworld
- Mr. Clinton Ford – Pitt and Sherry Consulting Engineers, Consulting Engineer
- Mr. Angus Hutchings – Safety Manager, Ardent Leisure
- Mr. Mark Thompson – Safety Manager, Dreamworld
- Mr. Troy Margetts – General Manager of Operations, Dreamworld
- Mr. Scott Ritchie – Engineering Supervisor, Dreamworld
- Mr. Damien Hegarty – Kaden Borros Legal, Representing Ardent Leisure

468. A general discussion was had as to what was known about the incident at the time, the mechanism and operation of the ride, as well as further information that needed to be provided by Dreamworld for the purpose of the OIR and QPS

[860] Ex B3A(2), pg. 19
[861] Ex B3A(2), pg. 20
[862] Ex B3A(2), pg. 21
[863] Ex B3A(2), pg. 36
[864] Ex B3A(11), [73]
[865] Ex B3A(2), pg. 38
[866] Ex B3A(2), pg. 52 & 53
[867] T2-59, lines 25-35

investigation into the circumstances of the tragedy.

469. Relevantly, during the conversation the following comments were made:

- Mr. Deaves noted that there was a 'pinch point' at the conveyor.[868]
- Mr. Deaves confirmed that the focus of the improvements to the ride have been at the start of the conveyor where there had been a bank up of rafts prior to the conveyor.[869] He claimed that this was based on 'historical knowledge'.[870]
- Mr. Ritchie advised investigators of the PLC switches at the beginning of the conveyor, and explained that they had been installed to 'stop the raft tip' if a pump stopped operating causing the water level to drop, it was recognised that there was the potential to catch on the conveyor and get tipped upwards.[871]
- Mr. Deaves claimed that there was review of the ride and testing was conducted. He recalls discussing the consequences of a pump failure, and what the best course of action would be in response to this, such as stopping the conveyor or the pumps. During these discussions, it seemed to have been accepted that the top of the conveyor, where the incident happened, was 'ok' as there was no historical knowledge of any problems.[872]

TECHNICAL CAUSE & CIRCUMSTANCES OF THE INCIDENT

470. Based upon the investigation, analysis and testing conducted on-site by Senior Constable Cornish, as well as consideration of supplementary documentary and physical exhibits, the technical timeline of the raft and conveyor movements shortly before and during the tragic incident, are as follows:[873]

I. At 2:03:50, the south pump can be seen to stop operating as water is rapidly flowing back into the pump outlet.[874]

II. Raft 6 is observed to exit the conveyor system at 2:04:05 initially moving freely into the trough. At 2:04:10, it is then seen to become stranded on the raft supporting rails at the interface area due to the sudden drop in the water flow.[875]

III. As the conveyor continues to operate, at 2:04:22, Raft 5 approached the start of the conveyor before beginning to commence traveling the incline. *At this time, Raft 6 had been stationary at the interface at the end of the conveyor for 12 seconds.*[876]

IV. Raft 5 can be seen approaching the downside of the conveyor at 2:04:50.

[868] Ex B3G(38)(f), pg. 1
[869] Ex B3G(38)(f), pg. 4
[870] Ex B3G(38)(g), pg. 6
[871] Ex B3G(38)(g), pg. 6
[872] Ex B3G(38)(g), pg. 7
[873] Ex B2, pg. 42-54
[874] Ex B2, pg. 43
[875] Ex B2, pg. 44
[876] Ex B2, pg. 44

It is now apparent that Raft 6 is seated directly on top of the support rails with insufficient water height in the area to allow the raft to flow forward.[877]

V. After Raft 6 has been stationary for 53 seconds, at 2:05:03, Raft 5 reaches the end of the conveyor and is released into the unloading zone. Contact between the two rafts first occurs at 2:05:03.[878]

VI. As the conveyor continues to operate, the rafts subsequently make contact three times. On each occasion, both rafts appear to move slightly forward, with Raft 5 bumping into Raft 6 causing it to move along the support rails before it comes into contact with the cross beam of the support rails. CCTV footage confirms that the conveyor is still in operation at this time, as the planks can be seen to be moving underneath Raft 5.[879]

VII. Following the third impact between the two rafts, contact is then maintained as they pivot upwards at the central contact point (2:05:06). This is because the force of the conveyor, an amount of compression between the contact point of each tube, the long plank and cross beam create a hinge point. The rear of Raft 6 and front of Raft 5 have then become slightly raised.[880]

VIII. At 2:05:07, the rafts appear to become inverted at an approximately 90 degree angle. At this time, Raft 5 has become entrapped between the moving conveyor and the fixed leading edge of the support rails.[881]

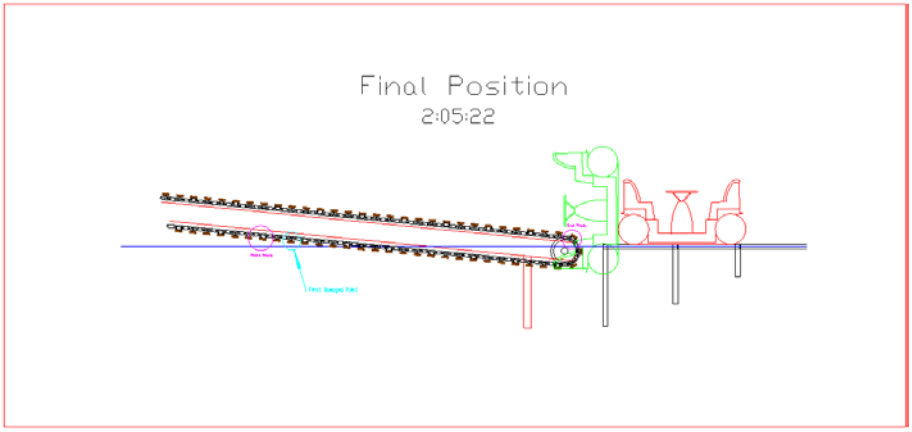
IX. Raft 5 has continued to invert, whilst Raft 6 has dropped back into a level position on the support rails. Raft 5 was inverted for 7 seconds before the conveyor began to slow, before coming to a complete stop a further 8 seconds later. During this time, 22 planks (eight long and 14 sets of short planks) have passed through the area, which is in contact with tubing and fibreglass construction of the raft.[882]

X. As Raft 5 became fully inverted, the conveyor continued to operate, causing the raft to shake violently, as each pass of the planks, long or short, damaged the raft ripping pieces of fibreglass from the tub construction. During this time, Raft 5 was pulled down within the interface void between the conveyor and supporting rails. At 2:05:11, Ms. Goodchild can be seen to be shaken from the raft. At 2:05:13, Mr. Dorsett also falls from the raft and into the moving conveyor drive axle and cog area. The conveyor can be seen to begin to slow at 2:05:14, coming to a final stop at 2:05:22.[883]

XI. The force and position of the raft has 'pulled' Raft 5 down between the conveyor and the support rails to a distance of approximately 45 centimetres. It was during this time that one of the air chambers of Raft 5 has become torn and deflated. The final resting position of Raft 5 is

[877] Ibid.
[878] Ibid.
[879] Ex B2, pg. 45
[880] Ex B2, pg. 46
[881] Ex B2, pg. 47
[882] Ex B2, pg. 47 & 48
[883] Ex B2, pg. 53

depicted below.[884]



FINAL RESTING POSITION OF RAFT 5 & RAFT 6 - Ex B2, pg. 51

471. It is evident that it only took one minute and 17 seconds from the time the south pump failed until Raft 5 became inverted.[885]

472. Investigators have established that within the first 15 seconds of a pump failure on the TRRR, approximately (200mm) of water height was drained.[886] As Raft 6 entered the unload area, there was insufficient water flow for it to proceed forward over the support rails once it exited the conveyor. This occurred within 20 seconds of the pump failure.[887]

473. Further testing conducted by Investigators following the incident confirmed that when one pump was not operational there was a difference in water level of

[884] Ex B2, pg. 50
[885] Ex B2, pg. 54
[886] Ex B2, pg. 77
[887] Ex B2, pg. 53

approximately (400mm), which occurred over approximately one minute.[888] When only one pump was in operation, it was found that there was insufficient water flow over the support rails in the unload area to allow rafts to pass over them. Within a minute, the rails can be seen to be exposed above the water.

474. Raft 6 was stationary for 53 seconds prior to coming into contact with Raft 5.[889] It took four seconds for Raft 5 to become inverted, and to commence to shake violently whilst the conveyor continued to operate at its normal speed.

475. Given the violent nature of Raft 5 being pulled into the mechanism, Ms. Goodchild and Mr. Dorsett were released from their Velcro strap seatbelts and tragically fell between the moving conveyor planks, drive axle and cog mechanism. Ms. Low and Mr. Araghi, who were positioned at the rear of the raft, were subsequently caught within the moving mechanism of the conveyor belt during the period of inversion, and were pulled into the plank and cog mechanism as it continued to operate.[890]

476. Raft 5 sustained significant damage to three of the six seats at the back of the raft where Ms. Goodchild, Mr. Araghi and Ms. Low were seated. There was no contact damage sustained to Raft 6.[891]

477. Testing of the E-Stops at the TRRR by investigators following the tragic incident, in the presence of Dreamworld staff, confirmed that none of the E-stop's had been activated at any time during the course of the incident.[892] CCTV footage of the incident also confirms this finding.

478. Testing also revealed that the opening of the pump outlets within the pit area under the conveyor were at a level lower than that of the raft support rails.[893] Due to this design aspect of the ride, and the large volume of water that is extracted during the reverse flow, the water drops below the level of the rails quickly.[894]

DEPICTS NORTH PUMP OPERATING WITH BACKFLOW & EXPOSED RAILS - Ex. B2, pg. 87

[888] Ex B2, pg. 76
[889] Ex B2, pg. 53
[890] Ex B2, pg. 51
[891] Ex B2, pg. 66
[892] Ex B2, pg. 38
[893] Ex B2, pg. 86
[894] Ex B2, pg. 86

Plank Damage and Observations

479. Investigators determined that during the course of the incident, eight large planks and 15 pairs of small planks were damaged.[895] The type of damage observed ranged from small chips of timber being removed to small planks being split into two.

480. During examination of the planks on the conveyor, Senior Constable Cornish noted that there were some large planks that had a degree of concave and convex bowing along the centre.[896] Video review of the CCTV footage suggests that the two 'pivot' planks passing under Raft 5 have a degree of convex bowing.[897] Testing was attempted to replicate whether these planks could cause an inversion, however, this was unsuccessful.[898]

Reconstruction of the Incident

481. A series of tests were conducted by Investigators with loaded and unloaded rafts in an attempt to reconstruct and replicate the incident. Whilst different set ups were utilised during the testing, with the rafts positioned and held by different methods, one test involved the holding of a raft in place in an attempt to replicate the positioning of Raft 6 whilst in a stationary position. The failure of the south pump was then emulated prior to the collision with a secondary raft. Whilst the raft inversion was not able to be replicated, the testing did reveal the following:

- Variations in the behaviour of the planks with the centre convex aspect were highlighted. Planks that bowed outwards were found to make considerably more contact with the floatation collar of the raft, gripping into wear strips and compressing the collar.[899] During the inquest, Senior Constable Cornish noted that whilst the bowing of the planks could be a variable in the incident, he was unable to say with any certainty whether they played a part.[900]

- The presence of the cross beam at the support rails near the unload area was found to restrict forward motion of the raft during the course of one test, and when this occurred, there was a 'severe' grab by a long plank at the rear of the raft on the wear strip of the collar.[901]

- The resistive nature between the rafts floatation collars and the exposed support rail was evident during testing.[902]

482. No inversion or pivoting of the rafts occurred during testing. Investigators opined that this may have been as a result of alterations in the positioning of the rafts during testing as opposed to the actual incident.[903] Nonetheless, during testing, the resistive nature between the rafts floatation collar and the exposed support rails was evident, as was the prospect of a large movement of the second raft by the first, which would force it along the support rails to the area of the cross

[895] Ex B2, pg. 62
[896] Ex B2, pg. 62
[897] Ex B2, pg. 62
[898] Ex B2, pg. 62
[899] Ex B2, pg. 89
[900] T2-39, lines 10-30
[901] Ex B2, pg. 89
[902] Ex B2, pg. 90
[903] Ex B2, pg. 91

beam.[904]

483. It was observed during testing that whilst the conveyor continued to move, combined with the convex planks and 0.78 m gap between the long planks, this created an open area for the floatation collar to slightly drop within, which makes it easier for the plank to make substantial contact with the wear strips.[905]

484. At inquest, Senior Constable Cornish stated that at the time of the reconstruction he did not have unrestricted access to a copy of the CCTV for the purpose of the positioning of the rafts.[906]

FCU Investigation Findings as to Causation

485. Having considered the Operator controls, design and mechanical function of the components of the ride, as well as the Operator procedures and safety features, Senior Constable Cornish reached the following conclusions as to the causes and circumstances of the incident:[907]

I. The primary cause of the event was due to the failing of the south pump, which in turn led to a sudden drop in water level. It was proven during testing that a raft was unable to complete the circuit when only one pump was in operation. Water level monitoring for the ride was undertaken through visual observations by the Operator, using existing structures of discoloration of the trough walls. *There was no automated safety system to monitor the water level and provide any audible or visual alert should the level fall below a safe operating level.*[908]

II. Monitoring the operation of the pumps was also through operator observation by way of the ride water level, a small digital ampere reading and the sighting of pump activation lights on the control panel. This monitoring is in addition to the other responsibilities of the Operators, which include the safe loading of patrons into rafts. Given the normal sounds of the environment when the ride was in operation, it was noted that there was no discernible change in environmental noise when one pump failed, and only one remained in operation.[909] *There was no audible alarm or visual warning associated with the failure of either one of the pumps, combined with a full ride shutdown.*

III. The two major components of the ride were the water pumps and conveyor, which were controlled independently of each other. Accordingly, when one of these components failed or malfunctioned, the other continued to operate. This was a factor during the incident, as the CCTV confirms that when the south pump broke down, the conveyor continued to operate at full speed, collecting Raft 5 and transporting it towards the unload area where the incident transpired.[910] *There is no automated electronic system recognizing the failure of one component which automatically ceases the operation of the other system.*[911]

[904] Ex B2, pg. 90
[905] Ex B2, pg. 92
[906] T2-23, lines 2-5
[907] Ex B2, pg. 9-7
[908] Ex B2, pg. 97; T1-86, lines 10-30
[909] Ex B2, pg. 97
[910] Ex B2, pg. 97 & 98
[911] Ex B2, pg. 98

IV. Raft 5 became entrapped within the gap of the conveyor and the raft support rails.[912] The intent of the raft support rails was to prevent the raft from dropping to the bottom of the trough and to reduce excessive heeling should the raft become unstable. *Senior Constable Cornish noted that it could not be determined if the closure of the gap would have prevented or increased any loss of life, given there was no automated shutdown systems in place. Consideration should have been given to the potential risk of the gap exposure and prevention of injury.*[913]

V. The height of the pump outlets was below that of the support rails. As such, during a pump stoppage and subsequent reverse backflow, the water level rapidly reduced below the rails given water will find its lowest point with the least amount of resistance.[914] Whilst the north pump was still operating leading up to the incident, it was visually noticeable that the majority of this water predominantly flowed back into the south inlet. *Senior Constable Cornish noted that had the height of the inlets been above the support rails this may have slowed the water extraction and ensured that sufficient water and/or current was available for a greater amount of movement of Raft 6 upon its exit of the conveyor.*[915]

VI. Within the unload area there was an Emergency Stop button easily accessible by the unload Operator, or a member of the public. It was established that this button was not utilised during the incident.[916]

VII. The visual inspection of the Main Control Panel area revealed that there was an obscured view of the conveyor, particularly the area where the tragic incident occurred.[917] Further, the CCTV monitors positioned at the Main Operator control panel did not have any available view of the unload area or end of the conveyor. *Senior Constable Cornish noted that, in his opinion, had the view of the conveyor/support rail interface area been unobstructed and the CCTV positioned in a more easily visible position with more views available, the identification of the incident may have been prompter.*[918]

VIII. 'Raft Safety Stops' were installed at the beginning of the conveyor, which detected a stationary raft and shutdown the conveyor. Had the same sensor mechanism be in place at the end of the conveyor, it would have acted as a secondary stoppage device, in conjunction with the automated pump and conveyor shutdown as was also recently proposed to be installed.[919]

IX. Examination of the main operating panel revealed that there was no Emergency Stop for the conveyor, only a standard stop button, which took 8-9 seconds to stop the operation. The implementation of an Emergency Stop for the conveyor, or a full ride Emergency Stop, which would have reduced the shutdown protocols.[920]

[912] Ex B2, pg. 98
[913] Ex B2, pg. 98
[914] Ex B2, pg. 98
[915] Ex B2, pg. 98
[916] Ex B2, pg. 98
[917] Ex B2, pg. 99
[918] Ex B2, pg. 99
[919] Ex B2, pg. 99
[920] Ex B2, pg. 99

X. Throughout the testing procedures and review of the CCTV footage, it became evident that once the first raft became stationary atop the support rails there was no other mechanism, other than water current, to enable it to flow/move through to the unload area.[921]

XI. The occupants were restrained in the raft by a large Velcro strap. There is no variation in the strap depending on the patron's age, gender or size, nor is there any vertical adjustment of the belts.[922] The locking mechanism was through the adhesiveness of the Velcro itself, with no secondary system. Had an alternate system, inclusive of a three or five point harness or a ride bar, as a secondary locking system to supplement the Velcro, this may have reduced the injuries to those killed, particularly Mr. Dorsett.[923]

XII. Senior Constable Cornish expressed the view that the Operators had a substantial amount of tasks and functions to perform, in a short timeframe, whilst also conducting continued operational requirements. He opines that the lack of automated safety systems, audible alarms, CCTV range and situational awareness training were contributing factors in this incident.[924]

486. In summary, Senior Constable Cornish found that:

> …it was not one single event that caused the fatal incident that occurred on Tuesday the 25th of October 2016, but a series of preventable safety features, operating procedures and engineering design faults all occurring together within a short period of time…
>
> In my opinion based on the information I have been supplied, the introduction of a simple water level alarm or other warning device(s), automated shutdown facilities or a change in operation procedures would have completely prevented this incident from occurring. Notwithstanding these modifications could have been introduced with independent evaluation and consultation from similar facilities worldwide. Acknowledging that the ride has been functioning for approximately 30 years, it must be known that advances in safety requirements and technology should be an integral part of any amusement ride and their maintenance and renovation programs.[925]

487. During the inquest, Senior Constable Cornish described the TRRR as 'severely' lacking in any type of automation, which is readily available.[926] He described the event as 'twofold' having occurred due to the design of the interface between the conveyor and support railings, as well as the lack of safety mechanism for the electrical system.[927]

[921] Ex B2, pg. 99
[922] Ex B2, pg. 100
[923] Ex B2, pg. 100
[924] Ex B2, pg. 100
[925] Ex B, lines 2, pg. 101
[926] T1-86, lines 26 & 27
[927] T1-86, lines 15-21

EARTH FAULT AND PUMP DRIVES EXAMINATION

488. Between 25 October and 2 November 2016, several electrical tests were conducted on the Danfoss Variable Speed Drives (VSD's) following the tragic incident in order to establish a probable cause of the noted Code 14 '*Earth Fault'*.

History of VSDs at Dreamworld

489. A VSD is an electronic device, which is connected to electrical mains power and, depending upon the control system used, regulates the electric motor speed via electrical power cables from the output terminals of the drive.[928] The VSD works as follows:[929]

> *The electric motor converts electrical energy provided by the drive into mechanical energy in the shaft of the electric motor, which is mechanically connected to the water pump and therefore turns the water pump, which then draws water from the inlet pipe through the pump with the outlet of the pump into the watercourse of the ride.*
>
> *The water flow and subsequent height of the water in the watercourse depends on the pump's output flow, which is governed by the motor speed. The motor speed is determined by the power (voltage and frequency) output of the drive which is set by an operator or a control system.*
>
> *…*
>
> *The VFDs adjust the speed of electric motors by varying the output (frequency and voltage) of the electrical supply to the electric motor.*

490. The design operating life of the VSD's was 10 years, with the estimated average operating time per unit being 6,000 hours/year.[930] According to Danfoss, under normal operating conditions and load profiles, the VSD's are maintenance free throughout its designed lifetime, other than cleaning of fan filters etc.[931]

491. Prior to the tragic incident, Danfoss had been contacted in February 2012 by Dreamworld regarding the number of faults and repairs required of the two VSD's since installation. Faulty parts were sent back to the factory for further analysis and the complaint was answered by Danfoss.[932] A service history for the North and South Pump drives show that service jobs were performed in 2008, 2009 and 2012.[933] In 2015, Danfoss Drives Help Desk were contacted by Dreamworld in relation to Earth Fault trips, which had been experienced on the South Drive.[934] Assistance was provided to the technician onsite as to an assessment of the drive and it was suggested that an external wiring problem be explored, motor low insulation resistance and for a new control card and ribbon cables to be replace and tested to see whether the Earth Faults continued. Danfoss' records

[928] Ex G2, [18]
[929] Ex G2, [19] – [22]
[930] Ex G2, [43]
[931] Ex G2, [44]
[932] Ex G2, [41]
[933] Ex G2, [56]
[934] Ex G2, [71]

suggest that AES swapped control cards with the North Drive when diagnosing the Earth Faults of the South Drive.[935]

492. According to Danfoss' records, Dreamworld had been advised that spares for the current drives were becoming limited and therefore, given the drives' age and operating hours, they should start to budget for replacement drives if they required 'reliable operation'.[936] In 2015, Danfoss sales partner, Electronic Power Solutions, requested a quotation for replacement drives, which was provided to Dreamworld.[937]

Testing on drives post incident

493. On 25 October 2016, Mr. Takac, an Electrical Services Technician with Applied Electro Systems Pty Ltd, attended Dreamworld to retrieve the 'fault logs' from the Danfoss VSDs.[938] From 2009 until June 2017, Applied Electro Systems Pty Ltd were contracted with Danfoss as an authorised service partner.[939] Records confirm that Applied Electro attended Dreamworld on a number of occasions during this time to carry out annual maintenance of the VSD's and when requested to service the drives, including on the following dates:[940]

- June 2012 – *Onsite commissioning of the VLT;*[941]and
- August 2013 – *commission drive with new motor.*[942]

494. In 2015, Mr. Takac made a call to Danfoss Drives Help Desk to seek guidance as to *'earth fault trips experienced on the south drive'.*[943] A help desk engineer provided assistance with the assessment of the drive. It was suggested that checks be undertaken to determine whether external wiring problems, motor low insulation resistance and to replace/test a new control card and ribbon cables be undertaken, to see if the Earth Faults trips continued.[944] New control cards were purchased and exchanged in the drives.[945]

495. In June 2016, Mr. Takac, on behalf of Applied Electro, attended Dreamworld to conduct maintenance of the VSD's at the TRRR. However, he was unable to do so as the south pump had broken down and was not in operation.[946] During the inquest, Mr. Takac confirmed that the requisite checks that needed to be carried out on the VSD's, including input and output voltage and currents, could not be performed when one of the pumps was not in operation.[947]

[935] Ex G2, [71]
[936] Ex G2, [46]
[937] Ex G2, [47]
[938] Ex B3A(22)
[939] Ex G2, [49]
[940] T16-73
[941] Ex G2(19)
[942] Ex G2(22)
[943] Ex G2, [71]
[944] Ibid.
[945] T16-76, lines 15-45
[946] T16-74, lines 17-45
[947] T16-74, lines 25-45

496. The logs taken following the tragic incident revealed that the 'South VSD' recorded eight trips, the first two of which were '*heat seek temperature too high*' faults and the remaining six were '*Earth Faults'*.[948] Mr. Takac was of the view that three faults appeared to have been recorded within a short time period.[949] He expressed the view that the various faults could have been caused by a number of reasons both internal and external to the VSD.[950]

497. According to the Danfoss Manual for the VSD, in relation to an Earth Fault it states, *'There is a discharge from the output phases to ground, either in the cable between the frequency converter and the motor or in the motor itself. Turn off the frequency converter and remove the earth fault'.*[951]

498. The first series of testing was carried out by Mr. Christopher Sandry, Senior Electrical Safety Inspector, OIR, who attended the scene on the day of the incident and on a number of occasions following. He was present for a number of walkthroughs and information downloads from the drives during the course of the days he attended site.[952]

499. Relevantly, on 28 October 2016, Mr. Sandry was requested by OIR to perform an insulation resistance test on the South pump motor. He determined that both the North and South pump motors needed to be tested in order to compare results.[953] He isolated the supply to the South and North pump motor drives by turning off the pump circuit breakers in the switch-room, which was confirmed in accordance with ESO procedure. He then disconnected each pump motor supply cable from their respective drive units. The insulation resistance test between each pump motor cable and earth revealed a reading of OL, which indicates that the resistance value is higher than the instrument can register.[954] The minimum value of insulation resistance to be deemed compliant by AS/NZS 3000:2007, the wiring rules, is 1 mega ohm.[955] As such, the pump motors were deemed to have passed.[956] On completion of the testing, Mr. Sandry reconnected all pump motor cables to their respective drive units.

500. Based upon the insulation resistance testing conducted, Mr. Sandy formed the view that the cause of the South Pump failure was the result of an intermittent fault in the pump drive unit.[957]

501. On 2 November 2016, representatives from Danfoss Pacific, including Mr. Mike Smits, Danfoss Pacific Director and Mr. Eduardo Gie, the Technical and Engineering Manager of Danfoss Drives, Danfoss (Australia) attended Dreamworld to examine the Danfoss VLT AQUA VLT 8502 Drives in use on the TRRR, which ran the North and South water pumps at the TRRR.[958] These drives had been in use at the ride since 2005. This was at the request of OIR for the purpose of visually inspecting the mechanical and electrical installation of the Danfoss drives, and to perform static and dynamic test procedures in line with

[948] Ex B3A(22), [34]
[949] Ex B3A(22), [36]
[950] Ex B3A(22), [37]
[951] Ex B3A(22), [35]
[952] Ex B4(6)
[953] Ex B4 (6), [38]
[954] Ex B4 (6), [42] & [43]
[955] Ex B4 (6), [43]
[956] Ex B4 (6), [52]
[957] Ex B4 (6), [52]
[958] Ex B15(15), pg. 2; pg. 4; Ex G2, [73]

the applicable service manuals.[959] Unfortunately, as the water pumps could not be run due to the water being drained, the dynamic testing could not be carried out.

502. Given the age of the two drives (approximately 10-11 years old) it was challenging to extract data from the units.[960]

503. The data that was obtained from the drive disclosed no recent Fault Trips on the North Drive, however, the South Drive recorded six recent Earth Faults, Trip Locked (Error Code 14).[961] The last three of these six fault alarms occurred within two hours.[962] An Earth Fault (Error Code 14) is described as follows,

> *'…a discharge from the output phases to earth, either in the cable between the frequency converter and the motor or in the motor itself. The drive relies on three current transducers to measure the output currents drawn by the motor, and when the addition of the three output currents are above 48% of nominal current of the VLT 8502 (658A) for 10 µsec it results on a Trip Locked Fault. A Trip Locked Fault is only cleared by cycling the main power supply and then a Local Reset to the frequency converter. As per drive's settings the reset function (Par. 400) was set to infinite and the auto restart time (par. 401) to 10 sec. Meaning that drive, during a Trip Locked condition, would have been ready to start the motor 10 seconds after cycling the mains supply, without the need to apply local reset.'*[963]

504. In a statement provided by Mr. Gie for the purpose of the coronial investigation, he noted that an Earth Fault is usually caused by conditions external to the drive and nothing was observed during the site visit, which would indicate that the faults were caused by an internal drive component.[964] The static test procedures conducted by Danfoss show that the main drives' components were within the range at time of measurement, except the fans mounted on the enclosure door. As such, the root cause of the earth faults leading up to the tragic incident could not be determined.[965]

505. Ultimately, a cause as to the Earth Fault could not be determined.

Recommended Course of Action in Response to an Earth Fault

506. According to Danfoss, their recommended course of action to ascertain the root cause of an Earth (Ground) Fault Alarm #14 is as follows:[966]

(a) Disconnect the mains supply to the VLT 8000;

(b) Remove the motor cables from the drive end;

[959] Ex B15(15), pg. 4
[960] Ex B15(15), pg. 2
[961] Ex B15(15), pg. 2
[962] Ex B15(15), pg. 8
[963] Ex B15(15), pg. 8
[964] Ex G2, [78]-[82]
[965] Ex G2, [78]-[81]
[966] Ex G2, [103]

(c) Measure the insulation resistance of the motor winding and earth, including the motor cables, with a test voltage > 500 V;

a. A low resistance measurement would mean a faulty motor, damage cable insulation, or presence of moisture in the motor cable and/or motor windings.

b. A high resistance value, in other words reading open, will require further investigation.

(d) Power up the drive without the motor cable connected, start the drive and read the motor current from the display. Any offset current reading .2A on the VLT's display without motor connected suggests the need for the re-calibration of the current sensor offset by doing an Automatic Motor Adaptation (AMA) procedure, select 'RUN LIMITED AMA' option in para 1-07.

(e) If the Alarm 14 keeps re-occurring after doing the AMA procedure, now with motor connected to the drive, there is either a large offset in the current sensors outputs, problem with the control card, problem with the +/-15 volts power supply on the power card that supplies the sensor circuit, a bad connection between the control card and sensors, etc. In this scenario a service call should be arranged to identify the faulty component within the drive.

507. It was noted that sometimes intermittent earth fault alarms, which occur more often over time, can be attributed to slow motor insulation resistance degradation.[967]

508. During the inquest, Mr. Takac was asked what his advice would be if he had been informed that there had been an *Earth Fault* over a number of days, and then in quick succession on the same day. He stated that he would recommend that the client *'obviously, stop the machine and not use it and investigate deeper what that earth fault is'.*[968] Mr. Takac noted that a recurrent issue like that requires *'a lot more thorough testing'.*[969]

Mr. Ritchie's Assessment of the Fault Prior to the Tragic Incident

509. Prior to the incident, it was Mr. Ritchie's assessment that the earth fault was no more than an inconvenient and intermittent issue, which did not pose any risk to guest or Ride Operator's safety.[970] During the inquest, he acknowledged that he had consciously made a decision that the 'intermittent fault' would not be a danger, as long as the operating procedures were followed.[971]

510. At the time of the incident, Mr. Ritchie states that as the fault was happening '*so intermittently (four times in six days to my knowledge) and because I had already contacted the experts to come and have a look at the situation, I did not consider that it was necessary to shut the ride down or take any further steps as there was no risk to staff or guests*'.[972]

[967] Ex G2, [104]
[968] T16-78, lines 40-48
[969] T16-79, lines 9-20
[970] Ex B3A(18), [53]
[971] T17-83, lines 10-30
[972] Ex B3A(18), [54]

511. During the inquest, Mr. Ritchie gave evidence that it was his firm view that the 'Alarm 14' error was caused by an internal fault in the drive, rather than the motors.[973] When challenged with the definition of the alarm as contained in the operating manual for the drive, which stated that *'there is a discharge from the output phases to ground either in the cable between the frequency converter and the motor or in the motor itself',*[974] Mr. Ritchie disagreed.[975] He was of the view that an Earth Fault could not be intermittent.[976] However, he was unable to explain, given his diagnosis, why during the QPS testing of the ride, which involved some 200 starts and stops, the drives didn't fail.[977] He based his opinion on '42 years' experience as an industrial electrician.[978]

HISTORY OF EXTERNAL SAFETY AUDITS AT DREAMWORLD

JAK Leisure Company Audits

512. In a scope of work prepared by Chief Executive Officer, Mr. Tony Braxton-Smith in January 2003, it appears that the need for a safety audit at Dreamworld was introduced, *'for internal purposes to provide an overall assessment as to the appropriateness of internal maintenance and engineering procedures and the safety of operations.'*[979] The assessment was intended to '*identify any issues that may impact on continued safe operation and to provide a prioritised list of specific items for management attention'*.[980] Accordingly, it was thought that a detailed evaluation would need to be conducted of all amusement rides, attractions, as well as associated buildings and structures, with the support and assistance of maintenance and operations personnel.

513. The Consultant engaged would be required, as part of the evaluation, to review the documentation, interview personnel and make physical inspections of the rides and attractions, with any further expert testing required to then be suggested.[981] A documented report was to be provided summarising the assessment, findings and recommendations, with indications as to priority.[982]

514. In terms of assessing the rides and attractions, Dreamworld required that the Consultant engaged to carry out the safety audit consider the following in relation to each ride:[983]

- Queue lines, walkways, platforms, stairs, ramps and related structures
- Safety systems
- Passenger carrying vehicles
- Passenger restraint systems
- Lighting
- Guards, barriers, fencing and enclosure area
- Track systems
- Structural and support components

[973] T18-37, lines 40-50
[974] Ex G2(28), pg. 178
[975] T18-37, lines 25-50
[976] T18-37, lines 45-50
[977] T18-40, lines 2-35
[978] T18-40, lines 33-38
[979] Ex F16B(23), pg. 1
[980] Ex F16B(23), pg. 1
[981] Ex F16B(23), pg. 1
[982] Ex F16B(23), pg. 1
[983] Ex F16B(23), pg. 1

- Drive systems
- Safety and instructional signage
- Ride area maintenance condition
- Safety related equipment
- Storage areas

515. In addition, the Consultant was also required to evaluate and assess ride operations and maintenance procedures, and comment on the following specific elements:[984]

    - Ride inspection and maintenance procedures
    - Daily ride opening, operation and closing procedures and compliance with manufacturers requirements
    - Training procedures and Operator certification
    - Comparison of written procedures and actual application of same
    - Review of maintenance documents and procedures
    - Review of preventative maintenance procedures and records
    - Review of annual service procedures and records
    - Review of incident reporting criteria
    - Safety and efficiency of ride operations

516. It appears that JAK Leisure Company were ultimately engaged for this purpose. JAK were billed as an internationally recognised auditor, who specialised in Theme Park rides and attractions.[985]

517. Documentation provided by Ardent Leisure confirms that JAK Leisure Company, which were based in the United States, were engaged at various intervals over a number of years to undertake an '*independent safety audit*' of Dreamworld to provide an '*overall assessment as to the appropriateness of internal maintenance and engineering procedures and the safety operations'*.[986] In the final reports provided of these assessments, which were titled, *'Loss prevention Survey'* of the amusement rides and attractions at the park, the scope of work commissioned appears to be,

> *'visual safety evaluations of all rides and associated buildings and guest waiting areas directly associated with each ride, including overall assessment of the condition of the ride and evaluation of the maintenance being performed'.*
>
> *Evaluation of the rides operation and any general issues that are noted regarding the ride.*
>
> *Visual safety evaluation of associated ride and attraction maintenance support facilities including mechanical inspection, housekeeping and documentation.* [987]

[984] Ex F16B(23), pg. 2
[985] Ex F16H(116), pg. 1
[986] Ex F16B(17)
[987] Ex F16B(1), pg. 2

518. The method and assessments conducted for the purpose of these inspections, included the following:[988]

- Personnel spent 12 days on-site observing and accessing the procedures and conditions of the park.
- Various management staff in the Engineering and Operations department were interviewed. In addition, mechanical and electrical technicians and Ride Operators were interviewed and observed in the function of their work.
- Procedures applicable to the Engineering and Operations Departments were considered before staff were observed to evaluate compliance.
- Manufacturer's manuals were considered to determine compliance.
- Compliance with Daily checklists by engineering and operations personnel were observed to determine compliance with procedures, as well as manufacturers and industry standards.
- JAK personnel walked each queue area, including stairs, ramps to note the condition. Safety signage was also observed and considered.
- All passenger carrying vehicles and restraint systems were examined.
- Track systems, ride structure, drive systems and storage areas (where applicable to the rides) were also examined.
- General Ride maintenance and condition were accessed on each ride and attraction.
- Safety equipment, including fire extinguishers, water rescue equipment and general life safety equipment and procedures were accessed.
- Operations training procedures, certification process and effectiveness were reviewed and confirmed.
- Reviewed preventative maintenance records and accident reporting.
- Evaluated Fire Safety systems in buildings, structural safety where applicable, and general condition of buildings.
- Reviewed organisational charts in both engineering and operations, and job descriptions of personnel in the Engineering Department.

519. Whilst it's not clear from the varied and somewhat sparse records available, it appears that inspections were carried out by JAK Leisure Company in the following years:

- 2003;
- 2004;
- 2006;

[988] Ex F16B(1), pg. 2

- 2008-9;
- 2012; and
- 2013

520. Mr. Dennis Gilbert, who was the President of JAK Leisure Company, during their engagement with Dreamworld, had previously held various positions within different International Amusement Parks, including Chief Operations Officer and General Manager.[989] In terms of engineering and mechanical matters, it does not appear as though he had any formal qualifications.

521. Mr. Kevin Hehn, who reportedly accompanied Mr. Gilbert during some of the inspections conducted at Dreamworld, was a certified Amusement Ride Inspector and maintenance technician, who had previously held positions as a Loss Control Specialist, ride mechanic and mechanical supervisor at various United States Theme Parks.[990]

522. Mr. Tan was responsible for assisting and coordinating JAK's audits, with support from the Operations and Safety Managers.[991] The reports provided by JAK following the audits were considered by the managers of the Engineering, Operational and Safety Departments.[992]

523. A summary of the findings of each of these Surveys, in relation to the TRRR, are outlined below.

May 2003 – Inspection[993]

524. From the final report provided by JAK, it appears that assessments of each of the rides at Dreamworld were conducted by Mr. Dennis Gilbert and Mr. Kevin Hehn, '*two qualified and experienced inspectors*'[994], between 1st to 14th May 2003.

525. With respect to the TRRR, the following issues were highlighted in Chapter 15 of the Final Report:[995]

I. *DWORLD 03-15-01*: It was noted that the E-Stop button on the Operator's control panel does not disable the conveyor when depressed. It was recommended that the system be adapted to ensure positive emergency stop to include all moving components to ensure full stop.[996]

II. *DWORLD 03-15-02:* The permanently mounted evacuation ladders poses as a blunt impact or possible entanglement hazard and should be removed or elevated higher.[997]

III. *DWORLD 03-15-03:* Loose anchor nuts on the guide rail bracket base, located near the crocodile element, which were recommended to be tightened.[998]

[989] Ex F16B(4)
[990] Ex F16B(6)
[991] Ex B3C(54), pg. 15
[992] Ex B3C(54), pg. 16
[993] Ex F16B(1)-(6)
[994] Ex F16B(17), pg. 2
[995] Ex F16B(3)
[996] Ex F16B(3), pg. 2
[997] Ex F16B(3), pg. 3
[998] Ex F16B(3), pg. 4

IV. *DWORLD 03-15-04:* Heavy corrosion noted beneath the station platform should be cleaned, evaluated and corrected.[999]

V. *DWORLD 03-15-05:* Recommend the placement of additional signage within the rafts stating the need to keep arms and legs within the raft at all times to ensure that all riders see decals.[1000]

VI. *DWORLD 03-15-06:* The location of the high voltage equipment for the main pumps in relation to the electrical panels could pose itself as a serious electrical hazard, should the adjacent retaining wall be breached by water. It was recommended that this issue be considered by a qualified electrical engineer.[1001]

VII. *DWORLD 03-15-07:* Recommend installing a removable guide rail across the opening of the reservoir gate/dam at raft level to prevent the possibilities of blunt impact.[1002]

VIII. *DWORLD 03-15-08:* Recommend that all control buttons be permanently labelled.

IX. *DWORLD 03-15-09:* The monitor at the Operator position had been removed. As this was the only means of observing the lower conveyor area, it was recommended that the monitor be replaced immediately and that the ride not be operated without this monitor in place or an Operator in place at a positon to observe the lower area.[1003]

X. *DWORLD 03-15-10:* Recommend that the areas that are step off, such as the unload area, be highlighted to bring attention to the change in elevation.[1004]

XI. *DWORLD 03-15-11:* Noted emergency stop on conveyor. Recommend all emergency stops be accented with the red colour.[1005]

XII. *DWORLD 03-15-12:* The life ring at the base of the conveyor was noted to not have AS certification stamp and is not recognised as a life saving device. IT was recommended that all life rings and life jackets be AS certified and dated. These should then be put on a review plan to ensure that they are checked every year for current dates.[1006]

XIII. *DWORLD 03-15-13:* Recommended proper safety signage of the Chlorine storage behind the TRRR.[1007]

XIV. *DWORLD 03-15-14:* Recommended that the Ride be pumped down on a more frequent basis that annually to allow a visual inspection of the weir logs, rail anchors and conveyor hardware, which are normally covered by water.[1008]

[999] Ex F16B(3), pg. 5
[1000] Ex F16B(3), pg. 6
[1001] Ex F16B(3), pg. 7
[1002] Ex F16B(3), pg. 8
[1003] Ex F16B(3), pg. 10
[1004] Ex F16B(3), pg. 11
[1005] Ex F16B(3), pg. 12
[1006] Ex F16B(3), pg. 13
[1007] Ex F16B(3), pg. 14
[1008] Ex F16B(3), pg. 15

526. Whilst documentation in relation to the TRRR was requested by JAK,[1009] it is not clear, from the records available, what information may have been provided for the purpose of the audit.[1010]

527. Upon completion of the final report, JAK presented the findings and recommendations to the Safety Executive Committee.[1011]

528. Following receipt of the report, it appears that an internal review by Dreamworld was to be undertaken to determine the priorities for each recommendation.[1012] This included a number of meetings, which were held between an Implementation Team that consisted of representatives from the Safety, Operations and Engineering Departments, who were required to consider and progress the recommendations made.[1013] According to Mr. Hutchings, this Implementation Team were responsible for categorizing the recommendations based on the risk posed, and the subsequent timeframe for which it needed to be executed.[1014] He noted that whilst the aim was to implement all of the recommendations, there were occasions when a decision was made not to do so, which would be recorded.[1015] According to Mr. Hutchings, there was no financial expenditure barrier to implementing the recommendations made by JAK.[1016]

529. Decisions as to the recommendations to be actioned and the timeframes were transferred into an Excel spreadsheet, which was updated when the status of items changed.[1017] The progress of implementing the recommendations was to be reviewed by Dreamworld's Safety Executive Committee on a quarterly basis, with monthly reviews undertaken by Departments.[1018] Each Department Manager was responsible for the final inspection and sign off on each item.[1019]

November 2004 – Inspection

530. Documentation provided suggests that further inspections were carried out by JAK between 2 and 11 November 2004.[1020] However, a letter dated 3 September 2004, addressed to Mr. Bob Tan, who was the General Manager of the E&T Department at Dreamworld at the time, suggests that an alternative had been sought to the '*full independent safety audit proposal*' initially provided by JAK. The alternate proposal was for a '*follow-up audit to review the progress from the previous visit*'.[1021] The extent of this 'follow-up' audit is outlined as follows:[1022]

- On-site audit and review of all items that were noted in the previous safety audit conducted by JAK in May 2003;

[1009] Ex F16B(16)
[1010] Ex F16B(15)
[1011] Ex C8(10), pg. 49
[1012] Ex F16H(116), pg. 1
[1013] Ex C8(10), pg. 42 -47
[1014] Ex C8(10), pg. 44 - 47
[1015] Ex C8(10), pg. 44
[1016] Ex C8(10), pg. 55 & 56
[1017] Ex F16H(116), pg. 2
[1018] Ex F16H(116), pg. 2
[1019] Ex F16H(116), pg. 2
[1020] Ex F16C(3), pg. 1
[1021] Ex F16C(11), pg. 1
[1022] Ex F16C(11), pg. 1

- Documentation and comment on progress made at Dreamworld on those items noted in the previous safety audit; and

- Documentation on items outstanding from previous report.

531. It was proposed that the inspection was to be conducted with one qualified inspector, and an electronic report prepared with photographs and '*the appropriate code and standards comments*', which was then to be presented to management at the conclusion.[1023] The cost of the report was quoted as being $9,500 ($US). At the conclusion of the correspondence, it was stated that:

> *It is the recommendation from JAK Leisure Company to all of our clients that consideration be given to the advantage of having our inspectors conduct a full independent safety audit on an annual basis. With the full audit, repeat items from previous reports are noted, as well as, all attractions and facilities are inspected for operational and maintenance safety issues.'*[1024]

532. The findings in relation to the TRRR were outlined in Chapter 15 of the final report.[1025] Helpfully, this report considered the recommendations made in 2003, and confirmed whether the recommended changes had been implemented. The findings were as follows:

I. *DWORLD 04-15-01:* E-Stop at the control panel now able to disable the conveyor as well.[1026]

II. *DWORLD 04-15-02:* Management assessed that the rafts do not hit the area where the evacuation ladder was placed. Action was marked as incomplete.[1027]

III. *DWORLD 04-15-03:* This item was marked as corrected and ongoing.[1028]

IV. *DWORLD 04-15-04:* In terms of the heavy corrosion observed bellow the station platform, this action item was marked as on going. It was further noted that given the age of the ride, the corrosion hidden by the themed elements may be 'severe'. As such, plans should be made to evaluate these areas for possible failure. This item was marked as 'ongoing'.[1029]

V. *DWORLD 04-15-05:* The additional signage had not been placed in the rafts. The item was marked as 'incomplete'. [1030]

VI. *DWORLD 04-15-06:* RCD protection was added to the high voltage equipment, and as such, the item was marked as complete.[1031]

VII. *DWORLD 04-15-07:* The flow of water was evaluated by management and it was determined that reservoir gating, which may create back draft of

[1023] Ex F16C(11), pg. 1
[1024] Ex F16C(11), pg. 1
[1025] Ex F16C(2)
[1026] Ex F16C(2), pg. 2
[1027] Ex F16C(2), pg. 3
[1028] Ex F16C(2), pg. 4
[1029] Ex F16C(2), pg. 5
[1030] Ex F16C(2), pg. 6
[1031] Ex F16C(2), pg. 7

water and could cause issues with rafts. The item was marked as closed.[1032]

VIII. *DWORLD 04-15-08:* In terms of the labelling of all control buttons, it was noted that progress had been made. As such, the item was marked as partially completed.[1033]

IX. *DWORLD 04-15-09:* The video monitor had been replaced and upgraded. The action item was marked as compete.[1034]

X. *DWORLD 04-15-10:* Areas of elevation highlighted. Item marked as complete.[1035]

XI. *DWORLD 04-15-11:* All emergency stops accented with red colour. Item marked as complete.[1036]

XII. *DWORLD 04-15-12:* In relation to the life ring at the base of the conveyor, the Australian Standard was researched by Dreamworld staff and it was found that there was none applicable. As such, no action was deemed to be required.[1037]

XIII. *DWORLD 04-15-13:* In relation to the chlorine storage behind the raft ride, it was noted that the water conditions had been improved. The recommendation in terms of the need for additional signage was to stand.[1038]

XIV. *DWORLD 04-15-14:* It was noted that the TRRR was pumped down two times a year to examine the condition of the trough. Item was therefore marked as complete.[1039]

533. In addition to the above, JAK also recommended that evacuation procedures be re-evaluated on rides where more 'specific evacuation procedures' are called for, which included the TRRR.[1040] The Dreamworld Board response to this recommendation was that *'specific ride evacuation procedures are in place for these rides…'* [1041]

534. A document titled, *'Information for JAK',* which was dated 4 November 2004, appears to outline the planned improvements to be carried out for various rides. In relation to the TRRR, the following actions were listed:[1042]

- Dual unload gates;
- Raft rotate feature;
- Timed dispatcher;
- Handgrips;
- E/Stop – 2 pumps?

[1032] Ex F16C(2), pg. 8
[1033] Ex F16C(2), pg. 9
[1034] Ex F16C(2), pg. 10
[1035] Ex F16C(2), pg. 11
[1036] Ex F16C(2), pg. 12
[1037] Ex F16C(2), pg. 13
[1038] Ex F16C(2), pg. 14
[1039] Ex F16C(2), pg. 15
[1040] Ex F16C(6), pg. 4
[1041] Ex F16C(6), pg. 4
[1042] Ex F16C(9)

- Conveyor stop?

535. It seems these were the actions Dreamworld intended to take or were considering carrying out in relation to this ride. No further information was provided as to why these actions had been included, and whether they were actioned.

536. A spreadsheet listing all of the audit items and recommended actions as suggested by JAK in relation to each ride, was maintained by Dreamworld, with the status of each item updated at various intervals.[1043] A spreadsheet from 24 April 2006, suggests that all of the outstanding action items for the TRRR, as listed above, had been completed except for the rebuilding of the timber load and unload stations, which was in progress at the time.[1044]

July 2006 – Inspections

537. Prior to a safety audit being conducted at Dreamworld in 2006, it appears that quotes were sought from JAK and David Randall and Associates (DRA).

538. On 25 January 2006, a quote was provided to Mr. Bob Tan by DRA in relation to Safety audits of Dreamworld, which would be '*looking at compliance to both AS3533 and the current Workplace Health & Safety Legislation*'.[1045] DRA, at that time, conducted audits for Warner Village Theme Parks, and had developed a checklist from AS3533 requirements, which covered the following elements:[1046]

- Maintenance schedules compared to the manufacturer's requirements and AS3533;
- Operations manuals compared with the manufacturer's requirements;
- Attendance at the daily inspections to ensure standardisation of procedures and training of staff;
- Observation of Operators to ensure compliance with operation procedures;
- An inspection of the ride to identify any areas of statute non-compliance, i.e. guarding, structural integrity etc; and
- Riding on the device to ensure clearance zones are observed, etc.

539. From previous experience at Warner Village Theme Parks, DRA suggested that it would take three days to thoroughly audit the large rides, with the smaller rides (such as the children's train) taking up to a day to complete.[1047] The proposed completed report by DRA was to include an executive summary, the results of the audit and an action plan to remedy areas of non-compliance ranked according to their risk. The risk assessment method utilised had been adopted from AS4360.

[1043] Example is Ex F16C(14) & Ex F16C(20)
[1044] Ex F16C(30)
[1045] Ex F16D(13), pg. 1
[1046] Ex F16D(13), pg. 1
[1047] Ex F16D(13), pg. 2

540. A scope of work was provided by JAK canvassing largely the same areas as was the case in 2003. Ultimately, a decision was made to once again engage JAK. Documentation provided suggests that further inspections were carried out at Dreamworld between 12 and 26 July 2006.[1048] On this occasion, a full independent safety audit of the Park was commissioned, which included an '*overall assessment of ride equipment, appropriateness of internal maintenance and engineering procedures, as well as, the safety of operations*'.[1049] In addition, emphasis was to be placed on the electrical area of the Park with a Professional Electrical Engineer attending as one of the qualified inspectors. It is important to note that in the scope of work provided by JAK, whilst it explicitly included '*visual loss prevention and safety evaluation of all Amusement rides*', as well as a '*visual safety evaluation of associated ride and attraction maintenance support facilities*', and '*visual evaluation of ride operations and maintenance procedures as related to safety and operational standards'*, the applicable Australian Standards (especially AS3533) are not cited, nor is any specific clarification provided as to what standard (if any) such an evaluation was to be conducted.[1050]

541. With respect to the TRRR, the following issues were highlighted in Chapter 15 of the Final Report:[1051]

I. *DWORLD 06-15-01:* Recommended that all access to boarding the ride by guests have accessible safety requirement signs.[1052]

II. *DWORLD 06-15-02:* Recommended that all objects, such as fans, theme pieces, lighting that could fall on guest pathways be secured with a safety cable to ensure single point failure will not allow to land on or swing into guests.[1053]

III. *DWORLD 06-15-03:* Recommend the placement of additional signage within the rafts stating the need to keep arms and legs within the raft at all times to ensure that all riders see decals. It was noted that this was a repeat recommendation.[1054]

IV. *DWORLD 06-15-04:* Control panel noted all buttons and indicator lights are properly labelled on day of audit.[1055]

V. *DWORLD 06-15-05:* Noted that the cameras in station area are not secured by secondary point. Recommended that all overhead objects be secured to prevent single point failure that could result in fall onto guests or employees.[1056]

VI. *DWORLD 06-15-06:* Noted actuator button not labelled. Recommend that all Operator buttons be clearly labelled.[1057]

[1048] Ex F16D(8)
[1049] Ex F16D(15)
[1050] Ex F16D(14)
[1051] Ex F16D(12)
[1052] Ex F16D(12), pg. 2
[1053] Ex F16D(12), pg. 4
[1054] Ex F16D(12), pg. 5
[1055] Ex F16D(12), pg. 6
[1056] Ex F16D(12), pg. 7
[1057] Ex F16D(12), pg. 8

VII. *DWORLD 06-15-07:* Recommend that the area under the lift hill be cleaned out and a handrail be replaced on the far side of the work area under the lift as it was severely corroded.[1058]

VIII. *DWORLD 06-15-08:* Recommend tightening the connector at the bottom of the motor unit. The current connector shown was loose at the time of inspection.[1059]

IX. *DWORLD 06-15-09:* Recommend opened electrical box and wiring be repaired or removed to prevent electrical shock.[1060]

X. *DWORLD 06-15-10:* Recommend the steel box tube located at the top of the lift hill in the access walk be secured to ensure it does not move out into the lift hill, or is loose to fall onto the feet of employees using the walkway.[1061]

XI. *DWORLD 06-15-11:* Recommend the Park have a certified diver available onsite to allow for immediate maintenance and inspection of the underwater items on the water attractions.[1062]

XII. *DWORLD 06-15-12:* Recommend installation of pipe supports for the PVC pipe under the pedestrian bridge over the rapids ride.[1063]

XIII. *DWORLD 06-15-13:* Recommend removal of all old bridge bolts from pedestrian bridge of the ride.[1064]

XIV. *DWORLD 06-15-14:* Recommend regular review of the pedestrian bridge plank bolts to make sure they are installed and holding the planks in position properly. The bolts should be galvanised or stainless.[1065]

XV. *DWORLD 06-15-15:* Conveyor – Recommend the UHMW plastic be chamfered at the end to reduce the chance for catching the lift chain boards while sliding on the plastic.[1066]

XVI. *DWORLD 06-15-16:* Conveyor - Recommend reduction in the amount of grease being used on the lift hill bearings.[1067]

XVII. *DWORLD 06-15-17:* Recommend the access gate to the lift hill of the ride be installed with a latch of some nature which cannot be opened by a standard guest.[1068]

XVIII. *DWORLD 06-15-18:* Recommend installation of a diagonal support behind the guide-way column in the rapids trough. The current column is loose at

[1058] Ex F16D(12), pg. 9
[1059] Ex F16D(12), pg. 10
[1060] Ex F16D(12), pg. 11
[1061] Ex F16D(12), pg. 12
[1062] Ex F16D(12), pg. 13
[1063] Ex F16D(12), pg. 14
[1064] Ex F16D(12), pg. 15
[1065] Ex F16D(12), pg. 16
[1066] Ex F16D(12), pg. 17
[1067] Ex F16D(12), pg. 18
[1068] Ex F16D(12), pg. 19

the anchor bolts and should be braced to reduce movement on impact from a raft at this location.[1069]

XIX. *DWORLD 06-15-19:* Recommend the light attached to the bridge just past the load station be secured using through bolts and a backing plate rather than lag screws.[1070]

XX. *DWORLD 06-15-20:* Recommend review of the anchor bolts for the weir in the water channel to be sure they are secure and tight to the channel bottom.[1071]

XXI. *DWORLD 06-15-21:* Recommend review of the old column supporting the old Sky Link deck above the ride, as it has a large amount of corrosion.[1072]

XXII. *DWORLD 06-15-22:* Recommend repairs to the rock work at the entry to the tunnel on the right side.[1073]

XXIII. *DWORLD 06-15-23:* Recommend review of the interior rock work in the tunnel of the ride as it has many cracks. A regular review of the condition should be made and a determination made what the useful life of the rock work is according to the installation.[1074]

XXIV. *DWORLD 06-15-24:* Recommend ALL logs and branches found within the tunnel area of the ride be secured to the deck so they cannot enter the trough of the ride.[1075]

XXV. *DWORLD 06-15-25:* Recommend all old posts and stands along the trough sides be removed.[1076]

XXVI. *DWORLD 06-15-26:* Recommend review of the air exhaust coming out in the tunnel passing under the mine ride.[1077]

XXVII. *DWORLD 06-15-27:* Recommend review of the corrosion on the columns supporting the tunnel roof and the mine ride, located adjacent to the rapids trough.[1078]

XXVIII. *DWORLD 06-15-28:* Recommend review of these open bulb type fixtures in areas above the guest ride.[1079]

XXIX. *DWORLD 06-15-29:* Recommend installation of or painting of the depth at the edge of the dock.[1080]

[1069] Ex F16D(12), pg. 20
[1070] Ex F16D(12), pg. 21
[1071] Ex F16D(12), pg. 22
[1072] Ex F16D(12), pg. 23
[1073] Ex F16D(12), pg. 24
[1074] Ex F16D(12), pg. 25
[1075] Ex F16D(12), pg. 26
[1076] Ex F16D(12), pg. 27
[1077] Ex F16D(12), pg. 28
[1078] Ex F16D(12), pg. 29
[1079] Ex F16D(12), pg. 30
[1080] Ex F16D(12), pg. 31

XXX. *DWORLD 06-15-30:* Noted sharp edge of roof below head height on the non-station side of the trough. Suggest that this be marked or removed to ensure no impact to the head of employees.[1081]

XXXI. *DWORLD 06-15-31:* Noted appropriate signs and response equipment to deal with chlorine storage area. Suggest measured introduction of chlorine into the Rapid Ride based on size and dosage necessary to maintain proper levels.[1082]

September 2009 – Inspections

542. From 21 to 30 September 2009, Ocean Embassy (Formerly JAK Leisure Company) conducted safety audits of the rides and attractions at Dreamworld.[1083] During this audit, personnel spent 12 days on-site, observing and accessing the procedures and conditions of the Park, as well as interviewing various staff at different levels.[1084]

543. Records suggest that the scope of work of the audit conducted in 2009 were intended to be a 'follow-up' and not a full independent safety audit.[1085] As such, the audit consisted of conducting visual loss prevention and safety evaluations of all amusement rides, attractions, associated buildings and facilities, review of the audit items carried out in July 2006, as well as a full safety audit of a number of rides, which included the TRRR.[1086] The specific issues cited for the TRRR were, *'manual handling issues with raft arrivals and handling; operational system in supervisor and operator competency training methodologies'.*[1087]

544. A fee of $26,200 (US$) was payable for this work and the provision of the final report.[1088]

545. With respect to the TRRR, the following issues were highlighted in Chapter 15 of the Final Report:[1089]

I. *DWORLD 09-15-01:* Verbiage on the official safety notice at the ride is repeated in the theme signs, which is acceptable if all official notices are in standard format on the red background signs and placed to ensure guests have access to read them prior to boarding.[1090]

II. *DWORLD 09-15-02:* Recommend that all objects such as fans, theme pieces, lighting that could fall on guest pathways be secured with a safety cable to ensure a single point failure will not allow it to land on or swing into guests.[1091]

[1081] Ex F16D(12), pg. 32
[1082] Ex F16D(12), pg. 33
[1083] Ex F16E(5)
[1084] Ex F16E(5), pg. 2
[1085] Ex F16E(114), pg. 1
[1086] Ex F16E(110), pg. 1 & 2
[1087] Ex F16E(110), pg. 1 & 2
[1088] Ex F16E(109), pg. 3
[1089] Ex F16E(7)
[1090] Ex F16E(7), pg. 2
[1091] Ex F16E(7), pg. 3

III. *DWORLD 09-15-03:* It was noted that the buttons and indicators on the control panel at the main Operator's booth were properly labelled on the day of the audit.[1092]

IV. *DWORLD 09-15-04:* **The 'emergency shutdown' procedure posted at ride. During an emergency, it was recommended that a simpler automatic process should be considered. Recommend that the safety system be updated to ensure correct steps are taken by a single emergency button, which will ensure the appropriate timing and sequence.[1093]**

V. *DWORLD 09-15-05:* Noted that cabinets at the panel area are in disarray and cluttered.[1094]

VI. *DWORLD 09-15-06:* Recommended immediate discontinued use of fan in queue area as it is rusted and corroded.[1095]

VII. *DWORLD 09-15-07:* Monitor at the Operator panel does not appear to be an outdoor, mountable monitor, and should be replaced or at least secured to prevent falling.[1096]

VIII. *DWORLD 09-15-08:* Recommended all overhead objects, including cameras, be secured to prevent single point failure.[1097]

IX. *DWORLD 09-15-09:* Noted that there was damaged and inconsistent application of safety decals on all ten rafts in the station. Recommend all decals be replaced and ongoing program to ensure proper decals are in place.[1098]

X. *DWORLD 09-15-09(2):* Noted non-skid finishes on entry to following boats has worn beyond its useful life on a number of rafts. Recommend a non-skid be applied to essential areas of loading.[1099]

XI. *DWORLD 09-15-10:* A number of rafts were seen to have Velcro seat belts worn beyond useful life.[1100]

XII. *DWORLD 09-15-11:* Recommended program instituted to check all life ring units and other such preservers around the bodies of water in the Park on a regular basis to ensure they are appropriate for planned use of rescue. Recommend research be undertaken to ensure compliance to Australian Standard of water safety.[1101]

XIII. *DWORLD 09-15-12:* Recommend review of the corrosion on the gates in the upper pump pool.[1102]

[1092] Ex F16E(7), pg. 4
[1093] Ex F16E(7), pg. 5
[1094] Ex F16E(7), pg. 6
[1095] Ex F16E(7), pg. 7
[1096] Ex F16E(7), pg. 8
[1097] Ex F16E(7), pg. 9
[1098] Ex F16E(7), pg. 10
[1099] Ex F16E(7), pg. 11
[1100] Ex F16E(7), pg. 12
[1101] Ex F16E(7), pg. 13
[1102] Ex F16E(7), pg. 14

XIV. *DWORLD 09-15-13:* Recommend installation of retaining clips on the grate at the end of the walkway above the pump pool and conveyor to hold gate section in place.[1103]

XV. *DWORLD 09-15-14:* Recommend replacing the boot material around the slide boot on the lift hill emergency stop box.[1104]

XVI. *DWORLD 09-15-15:* Recommend review of the corrosion in the service area by the pump motors.[1105]

XVII. *DWORLD 09-15-16:* Recommend replacing the wooden members of the roof under the lift hill chain during the chain change out. The wood has significant rot and should be replaced as soon as budget allows.[1106]

XVIII. *DWORLD 09-15-17:* Recommend the heat tape used on the motors be installed permanently or that a switch box be installed to control the operation and protect against shock.[1107]

XIX. *DWORLD 09-15-18:* Recommend the mount bolts for the motors are Ultrasound tested to verify condition on a regular basis if not currently done.[1108]

XX. *DWORLD 09-15-19:* Recommend review of the underside of the main bridge crossing over the ride. The bridge was scheduled for replacement in a year or so.[1109]

XXI. *DWORLD 09-15-20:* Recommend installation of safety cables to prevent the single point mount or attachment from breaking – lighting.[1110]

XXII. *DWORLD 09-15-21:* Recommend the landscape hanging into the ride be monitored by the landscapers and trimmed as necessary. [1111]

XXIII. *DWORLD 09-15-22:* Recommend installation of a board at the lower third board level in order to keep boats from getting caught under the upper two boards – in cave.[1112]

XXIV. *DWORLD 09-15-23:* Recommend using shorter tire pieces to keep them better attached to the wood supports.[1113]

XXV. *DWORLD 09-15-24:* recommend the chlorine response kits are checked on a regular schedule and the paperwork is checked for readability.[1114]

XXVI. *DWORLD 09-15-25:* Recommend review of the boat maintenance area and how it is utilised for the work process on the boats during normal operation.

[1103] Ex F16E(7), pg. 15
[1104] Ex F16E(7), pg. 16
[1105] Ex F16E(7), pg. 17
[1106] Ex F16E(7), pg. 18
[1107] Ex F16E(7), pg. 19
[1108] Ex F16E(7), pg. 20
[1109] Ex F16E(7), pg. 21
[1110] Ex F16E(7), pg. 22
[1111] Ex F16E(7), pg. 23
[1112] Ex F16E(7), pg. 24
[1113] Ex F16E(7), pg. 25
[1114] Ex F16E(7), pg. 26

It was suggested that a lift unit or rail system could be installed to assist in the movement of the boats within the area.[1115]

546. Further supplementary comments were provided by the auditors, which were detailed in a separate report.[1116] In relation to the TRRR, the following was recommended:[1117]

- Noted that the manual handling and turning of units as they enter the unload area on a relatively unstable waterway presents operational and safety issues in preventing guests or staff from stumbling or falling. It was noted during the audit that unload Operators were handling the rafts in a consistent manner in accordance with procedures.

- Suggestions to solve the instability of the units were:

    - A rotating system commonly used on other raft rides to allow continued movement of units and to provide a stable surface for units to rest upon during the load and unload process.

    - Queuing of boats in the load/unload area and loading/unloading in mass and then dispatching with spacing. This would require a belt system to be speedy and steady enough to handle.

    - Indexing the units on a stable surface – suggested to be the safest option.

- It was recommended in report that control system be reviewed and consideration be given to updating, especially in relation to the emergency shut down procedure.

March 2013 – Inspections

547. From 17 February until 2 March 2013, Ocean Embassy conducted safety audits of the rides and attractions at Dreamworld.[1118] The scope of work intended to be the subject of these full safety audits where outlined by Mr. Bob Tan in a document dated 4 June 2012, and largely consist of those previously provided by JAK.[1119] It appears that three companies were approached to provide a quote on the proposed scope of work, however, only two responded.[1120] Ultimately, Ocean Embassy was selected to conduct the audits. The cost for this service was $30,200 (US$).[1121]

548. With respect to the TRRR, the following issues were highlighted in Chapter 15 of the Final Report:[1122]

    I. *DWORLD 13-15-01:* Recommended evaluation of allowing Bats within the tunnel of ride. Also, review of concrete ceiling inside the ride.[1123]

[1115] Ex F16E(7), pg. 27
[1116] Ex F16E(1)
[1117] Ex F16E(1), pg. 7
[1118] Ex F16F(20), pg. 1
[1119] Ex F16F(9)
[1120] Ex F16G(14)
[1121] Ex F16G(16)
[1122] Ex G16F(18), pg. 244 onwards
[1123] Ex G16F(18), pg. 245

II. *DWORLD 13-15-02:* Recommend bolts on weir log be changed or secured so it will not be sticking up and result in impact with boat tube.[1124]

III. *DWORLD 13-15-03:* Recommend general clean-up in the pump pit area of the ride.[1125]

IV. *DWORLD 13-15-04:* Recommend fire extinguishers be placed in compliance with the Dreamworld requirement for inspection every 6 months.[1126]

V. *DWORLD 13-15-05:* Recommend the themed wood and items on the loading deck of the ride to be repaired, changed out and removed.[1127]

VI. *DWORLD 13-15-06:* Recommend labelling of the gate and E-stop buttons of the ride, located at the far end of the boat dispatch fence. Ride control buttons should be labelled and identified as to action and/or function.[1128]

VII. *DWORLD 13-15-07:* Recommend repainting of the EXIT and 'arrow' on the walkway from the ride to better identify the exit pathway and direction.[1129]

VIII. *DWORLD 13-15-08:* Suggest removal of chlorine kit at the back of the TRRR.[1130]

IX. *DWORLD 13-15-09:* Noted roof deterioration with pieces of roof falling off. Recommend review of queue structure and roof for repair.[1131]

X. *DWORLD 13-15-10:* Noted emergency light failed the power test. Recommend review of all emergency lights in queue and review of testing method and frequency.[1132]

XI. *DWORLD 13-15-11:* Noted rusted and corroded fan in queue area. Recommended discontinued use of fans in this condition.[1133]

XII. *DWORLD 13-15-12:* Noted cameras in station do not have safety cable to prevent single point failure.[1134]

XIII. *DWORLD 13-15-13:* **Noted 'emergency shutdown' procedure posted at the ride. Recommended that during an emergency, a simpler automatic process should be considered. Recommend that the safety system be updated to ensure correct steps are taken by a single emergency button, which will ensure the appropriate timing and sequence.[1135]**

[1124] Ex G16F(18), pg. 246
[1125] Ex G16F(18), pg. 247 & 248
[1126] Ex G16F(18), pg. 249
[1127] Ex G16F(18), pg. 250
[1128] Ex G16F(18), pg. 251
[1129] Ex G16F(18), pg. 252
[1130] Ex G16F(18), pg. 253
[1131] Ex G16F(18), pg. 254
[1132] Ex G16F(18), pg. 255
[1133] Ex G16F(18), pg. 256 & 257
[1134] Ex G16F(18), pg. 258 & 259
[1135] Ex G16F(18), pg. 260

XIV. *DWORLD 13-15-14:* **Noted Operator panel – the labelling was 'worn and difficult' to read, Recommend replacement of faded labels**.[1136]

XV. *DWORLD 13-15-15:* Expired registration is posted at ride and should be removed - not required.[1137]

XVI. *DWORLD 13-15-16:* Poor housekeeping in control panel area. Recommended that it be kept in good order and better practices be enforced.[1138]

XVII. *DWORLD 13-15-17:* Noted damaged and inconsistent application of safety decals on rafts. Recommend all decals be reviewed and replaced as necessary. Further recommended that there be an ongoing program to ensure proper decals are in place.[1139]

XVIII. *DWORLD 13-15-18:* Recommended program instituted to check all life ring units and other such preservers around the bodies of water in the Park on a regular basis to ensure they are appropriate for planned use of rescue. Recommend a reaching hook be placed near such bodies of water and that an inspection program be implemented on all water-safety equipment with proper tags and records.[1140]

XIX. *DWORLD 13-15-19:* Safety cable to be installed for overhead speaker at front of ride.[1141]

549. A spreadsheet was maintained recording each of the recommendations made by JAK/Ocean Embassy and Dreamworld's response, including whether the task had been completed or whether the risk was acceptable and no further action needed to be taken.[1142] The recommendation suggesting a simpler automatic shutdown process for the TRRR was recorded as '*risk acceptable*'.[1143]

Comments about JAK / Ocean Embassy Safety Audits

550. The safety audits conducted by JAK Leisure Company/Ocean Embassy, whilst seemingly thorough, were largely focused on the aesthetic issues associated with rides and attractions at Dreamworld, rather than a proper safety assessment against the applicable Australian Standards (AS-3533). This limitation was known and recognised by Dreamworld in supporting documentation provided during the course of the inquest hearing, whereby it was noted that,

> *An external audit is performed every 3 years by JAK. Reviewing the value of this audit. Much time is being spent on aesthetics per the external audit when more pressing issues need to be addressed. The difficulty with JAK audit is they are based internationally and are not aware of the Australian Standards which are usually different to international standards.* ***Is there an Australian body that does a similar audit/review?*** *Based*

[1136] Ex G16F(18), pg. 261
[1137] Ex G16F(18), pg. 262
[1138] Ex G16F(18), pg. 263
[1139] Ex G16F(18), pg. 264
[1140] Ex G16F(18), pg. 265 & 266
[1141] Ex G16F(18), pg. 267
[1142] Ex D6(129)
[1143] Ex D6(129)

on price, being coming for 8 years. There are Australian companies that do the same thing.[1144]

551. During the inquest, Mr. Hutchings acknowledged the concern held in relation to the fact that the audits by JAK were not being conducted to the Australian Standards.[1145]

552. The reoccurring nature of the recommendations made by JAK, particularly given the cost of the reports, was also raised by Dreamworld staff in the E&T Department following the 2013 audit.[1146] It was noted that:[1147]

> *<u>Issues</u>*
> *An analysis of each JAK survey identifies common issues and recurring recommendations for each ride. So much so, the survey report from 2013 is substantially similar to that of previous surveys. Given that each JAK review costs circa $60K, it is debatable whether a future JAK survey (scheduled for 2016) represents ongoing value for money. This issue has generated discussion amongst the Dreamworld Safety and Engineering Departments as to what other options are available to improve safety outcomes and ensure value for money.*
>
> *<u>Most preferred option</u>*
> *Whilst various options are available, the most preferred option would involve a twofold approach focussing on improving existing systems as well as an external auditor subjecting the rides/systems to an Australian Standard 3533 audit.*
>
> *…*
>
> *AS3533 Audit – as of 2012, the new nationalised safety legislation requires all amusement devices to be inspected and accredited against AS3533. Whilst this could be done with in-house expertise, the preference is to utilise independent expertise. (JAK are not able to undertake specific AS3533 audit, as they predominantly reference American and European standards). However, a variety of local or international auditors could perform this task…*

553. Unfortunately, despite repeated attempts during the course of the coronial investigation to contact and obtain information from Mr. Gilbert and JAK Leisure Company/Ocean Embassy, no response was ever received. It is not entirely clear, therefore, the actual extent of JAK's involvement with Dreamworld, the scope of the brief or the intended limitations of the advice provided. This is further exacerbated by the limited and ad hoc nature of the documentary records retained, a significant number of which were only provided whilst Court was sitting, rather than beforehand.

554. That being the case, given the qualifications of Mr. Gilbert and Mr. Hehn, which were known prior to engagement with the company, as well as the superficial

[1144] Ex F16H(7), pg. 1
[1145] T21-49, lines 5-35
[1146] Ex F16H(115)
[1147] Ex F16H(115), pg. 1 & 2

nature of the audits conducted, as was recognised by Dreamworld, it seems obvious that the safety advice provided was not intended to be a substitute for a thorough hazard assessment of the amusement rides, as was stipulated pursuant to the Standards.

555. Furthermore, some of the recommendations made by JAK, which may have pertained to safety, such as the labelling of the Main Control Panel buttons and the E-Stop at the unload area, which were raised in previous years, were not actioned by Dreamworld. In 2013, the Main Control Panel at the loading area when considered by JAK appeared as below:[1148]

556. The Main Control Panel on the date of the incident, appeared as follows:[1149]

557. Mr. Naumann, the Maintenance Planner for Dreamworld at the time of the incident, acknowledged during his interview with OIR, that the recommendations made by JAK, particularly as to the labelling of the control panel and E-Stop at the unload area at the TRRR, should have been actioned during the annual shutdown of the ride, however, were not carried out.[1150] He could not offer an

[1148] Ex F16F(19), pg. 261
[1149] Ex B6(6)(g)(ii), pg. 50
[1150] Ex B3C(15), pg. 18

explanation as to why this hadn't occurred.

558. The E-Stop at the unload area at the time of the tragic incident, appeared as below:[1151]

559. Despite the recommendations made by the external auditor that the ride control buttons, including the E-Stop, should be labelled and the action identified, in a response provided to OIR by Ardent during the course of their investigation into the circumstances of this tragic incident, they maintain that *'the emergency stop button at the unload platform of the TRRR was clearly marked on 25 October 2016'.*[1152] This is clearly not the case.

DRA Safety Management Audits

560. In 2013, DRA Safety Specialists were first engaged by Ardent Leisure through Mr. Hutchings, to conduct audits of the Work Health and Safety Management Systems (WHSMS) in place in all of its businesses, including Dreamworld, having regard to the National Self Insurance WHS Audit tool (based on AS 4801).[1153] The Managing Director of DRA, Mr. David Randall, who is a certified practicing engineer and a globally certified OHS auditor, states that these audits involved a '*systematic examination of the WHSMS against defined criteria in the*

[1151] Ex C4(5), pg. 316
[1152] Ex C6(7), [66]
[1153] Ex C4(16), pg. 1; Ex C5(35)(a), pg. 5

National Self Insurance WHS Audit Tool, to review its effectiveness in managing health and safety in the workplace and ensure it achieves the organisation's policies and objectives in that regard', which is done by looking at the procedures and processes set up to manage an overall health and safety program.[1154] This auditing process is different to that of a workplace inspection to detect specific deficiencies, failures or hazards in particular processes or areas.

561. Whilst DRA were also engaged by Dreamworld to consider two specific instances on rides involving the Cyclone Rollercoaster and the Log Ride, they were not involved in the inspection of any specific ride from a safety or operational perspective.[1155] Mr. Randall confirmed that the TRRR was not specifically inspected or part of the audits conducted.[1156]

562. Following DRA's first WHSMS audit in 2013, annual audits were scheduled and performed in February 2014 and July 2015 for the purpose of determining whether the WHSMS had been properly implemented and maintained, and to monitor the process of the implementation of recommendations made.[1157] Subsequent consultancy visits were also undertaken to further assist with implementation in October 2014, November 2014, January 2015, April 2015, December 2015, April 2016 and August 2016.

563. According to Mr. Randall, the safety management system at Dreamworld was below industry standards when compared to Village Roadshow Parks, however, was above others.[1158] He describes Village Roadshow's safety management system and the recording for the maintenance of their rides as 'strong', and he intended to try and assist Dreamworld to achieve a similar standard.[1159] During the inquest, Mr. Randall stated that after his audit at Dreamworld, he identified the need for a '*very strong safety maintenance system'* to be put in place, as well as a 'good maintenance engineer' to establish the systems required.[1160]

564. Following on from Mr. Randall's recommendations, it appears that Mr. Deaves was promoted to General Manager of Engineering, with Mr. Tan being moved to Special Projects. In relation to Mr. Tan, Mr. Randall stated during the inquest that, *'he is a very capable engineer, but the systems that I desire and require for me to be able to certify a ride weren't there.'*[1161]

<u>February 2013 Audit</u>

565. The first audit conducted by DRA at Dreamworld took place over four days in February 2013.[1162] It involved a desktop audit of Dreamworld's WHSMS, along with a review of Departments, including Operations and Maintenance, which included an evaluation of checklists, worker competencies, risk management documentation for particular rides, as well as a pre-start inspection of the newest ride, the Buzz Saw.[1163]

[1154] Ex C4(16), pg. 1
[1155] Ex C4(16), pg. 2
[1156] Ex C5(35)(a), pg. 16
[1157] Ex C4(16), pg. 1
[1158] Ex C5(35)(a), pg. 13
[1159] Ex C5(35)(a), pg. 14
[1160] T24-6, lines 20-30
[1161] T24-6, lines 37-47
[1162] Ex C4(16), pg. 1
[1163] Ex C4(16), pg. 1

566. The Executive Summary of the findings highlight the following matters:[1164]

- The safety management system was originally located on Lotus Notes, which was no longer supported and had limited access throughout the Park. The documents had recently been transferred into a common drive whilst they were being reviewed and updated to current legislative requirements. *In essence, there was no documented Safety Management System in operation within the Park.*[1165]

- The rides and attractions were being well maintained with competent staff, however, there was no documentary evidence to support this process.

- The Safety Unit was noted to be very operational in that most of the day was involved in hands-on activities from conducting inspections to providing training, with little available time for strategic development of the Safety Management System.

- The implementation of Figtree, as a platform for risk management, was praised as an excellent platform for managing the risks within the Park incident reporting. However, managers were required to finalise incidents open for their departments to ensure it reflected the current status of the Park.

- It was noted that emergency procedures were well managed, with staff participating in evacuation drills, attending training annually with procedures reviewed regularly.

567. The areas for improvement were listed as follows:[1166]

- *Safety Management System:* The SMS has not been reviewed for a long period of time and is currently not compliant with the Harmonised Legislation. Procedures do not clearly identify the reference against which the document seeks compliance nor does it clearly define responsibilities for the implementation of that procedure.

- *Document Management System:* There is no document management system to manage version control, develop approval work flows etc. The current process is to use a common drive for storing the data in Word and Adobe Acrobat, which is inaccessible to most staff.

- *Ride and Attraction Documentation:* Although the rides and attractions appear to be well inspected and maintained, there is no evidence that the inspections comply with the manufacturer's requirements or AS3533, there has been no formal risk management process applied to the rides and competencies of staff to inspect and maintain the rides has not been demonstrated etc.

- *Engineering Training Records:* There is little to no evidence of department induction, work at height, confined space training, competency to operate high risk plant and equipment and records of

[1164] Ex F(8)(1), pg. 3
[1165] Ex F(8)(1), pg. 3
[1166] Ex F(8)(1), pg. 4

licenses etc. With the appointment of the new Engineering Manager and administration staff member, the program is being resurrected and will require significant resources to bring it back to compliant levels.

- *Lock-out Tag-out Procedure (LOTO):* The blue tag system allows maintenance staff to work on equipment while it is operational without a competent person at the control panel. All rides and attractions must have the controls locked out to prevent the inadvertent starting of that equipment while persons are in the ride envelope which will require a complete review of the LOTO procedure and some modification to Ride Operator consoles.

- *Job descriptions/KPI's:* Significant review of job descriptions will be required to ensure that the essential and desirable skills of that role have been clearly identified, and the quantifiable safety responsibilities where applicable are detailed for the role. Performance evaluation reviews are ad hoc and safety key performance indicators are in their infancy for General Managers. Hence, there is no clear understanding of who is responsible for certain safety activities and no measure of performance to those activities.

- *Consultation:* This is in regards to the purchasing of new attractions, the purchasing of plant and chemicals within departments whereby there is no formal process to ensure stakeholder involvement.

- *Electrical compliance:* Compliance with the *Electrical Safety Regulation 2002* is being readdressed with safety switches being performance tested after a five year absence from testing, and electrical equipment in Maintenance Workshops scheduled for testing and tagging after not having been tested since 2011.

568. In summary, the audit of the Safety Management System at Dreamworld received a final score of 41.7%, which was low and predominantly due to the lack of an up-to-date, easily accessible document controlled Safety Management System that sets the framework for compliance to the legislative requirements.[1167] A score of 75% is seen as fully compliant with such requirements. At inquest, Mr. Randall noted that a compliance mark about 75% was required under the audit tool for self-insurance.[1168]

569. In relation to the comment made in the Executive Summary as to the fact that there was no evidence that the rides complied with AS-3533 and no formal risk management process applied to the rides, Mr. Randall told OIR investigators that the reason he had included this was that it had become evident after the first audit that there were no records for the amusement rides to be able to demonstrate compliance with the manufacturer's requirements or AS3533.[1169] *In July 2015, Mr. Randall recommended that a junior engineer be appointed to complete a full ride audit every two months, which could be verified by an external specialists.*[1170]

[1167] Ex F(8)(1), pg. 5
[1168] T24-15, lines 1-10
[1169] Ex C5(35)(b), pg. 18
[1170] Ex C5(35)(b), pg. 18

2014 Audit

570. Between 24 and 28 February 2014, DRA attended Dreamworld to conduct a Management Systems Audit, using the National Self Insurers Audit Tool V2.1.[1171] The audit was conducted in conjunction with the Safety Department, and included interviews with various Departmental Managers and Supervisors.

571. The following comments were made in the Executive Summary as to the findings of the audit:

- The current Safety Management System was out of date, fragmented and requiring significant resources to bring it up to current legislative standards. The previous year had been spent developing a platform to house and manage the Safety Management System documents along with the purchase of a product, which can be used as a guide in the development of the procedures. It was noted that significant resources will be required to update and review all the policies and procedures and transfer them into the Oracle Document Management System.

572. The strengths identified during the audit were listed as follows:

- *Training*;
- *Electrical* - Significant work had been undertaken by the Engineering Department, and electrical tagging and testing had been systemised, although non-compliances were identified within the Audit;
- *Contractor Management* – Significant work had been undertaken to ensure all contractors engaged onsite have been inducted and have provided details of their relevant insurance policies and safe work methods before commencing work;
- *Incident/Hazard Reporting* – Figtree usage is improving across all departments, which is now providing useful data for quarterly reports;
- *Consultation* – Significant work had been undertaken to improve consultation across the Park with regard to the introduction of new equipment, attractions and procedures. Change management documentation is in the process of implementation;
- *Job Descriptions/KPI's* – A review of job descriptions indicated that essential and desirable skills of the role have been clearly identified, and management staff now have a safety KPI linked to their pay.

573. The areas for improvement were similar to that stated in the 2013 audit, and included the following:[1172]

- *Safety Management System* – Safety Direct is now available in Oracle and includes a safety management plan for its effective implementation. Significant work will be required to implement the SMS, which will require the Executive Leadership Team to determine which procedures have

[1171] Ex F(8)(2), pg. 3
[1172] Ex F(8)(2), pg. 4

priority for implementation.

- *Rides and Attraction Documentation* – Although significant work had been undertaken by the Engineering Manager to collate all the documentation for rides in an electronic format and make it available for staff, the following issues were still found to have existed:[1173]

    - Inspection checklists for each ride have not been formally compared to the manufacturers requirements, and during the audit, where differences have been noted there is no evidence to support the change in inspection.

    - Standard operating procedures for daily and weekly inspections have not yet been developed and hence there is no consistency in the inspections performed by maintenance staff.

    - There are limited records of competency assessments of engineering staff to perform the daily and weekly inspections, and what does exist is an assessment against an inspection sheet rather than a standard operating procedure.

    - The existing lock-out tag-out system still relies on an administrative control i.e. tag, to prevent the operation of a ride whilst a maintainer is in the ride envelope.

- *Corporate Risk Management* – Consideration of generating a corporate register which records all issues raised through internal and external audits. A single register will enable management to prioritise the risks and allocate resources accordingly.

- *Training Plan/Records* – A majority of the training was undertaken within departments and training records held at this level. There is no electronic Learning Management System which would enable the recording of training against each individual.

- *Hazardous Chemical Management* – Without purchasing controls on chemicals, chemical registers are out-of-date which places the organisation at risk.

- *Lock-out Tag-out:* This system needed to be revised as a matter of priority to ensure that it achieves the single aim of ensuring staff entering the ride envelope cannot be struck by a ride.

574. In summary, the audit on this occasion had a final score of 46.1%, which was noted to only be a 'marginal improvement' on that achieved in 2013.[1174] It was suggested that the recommendations of this report be placed into a Corporate Risk Register, prioritised and allocated to Managers for implementation, following which significant improvements will be made.[1175]

[1173] Ex F(8)(2), pg. 4
[1174] Ex F(8)(2), pg. 6
[1175] Ex F(8)(2), pg. 6

575. Mr. Randall claims that the 46.1% score obtained on this occasion following the audit surprised him as he had expected a far greater improvement in the 12 months with the implementation of the recommendations made in 2013.[1176] It was his understanding that this limited improvement was due to resources within the Safety Department at Dreamworld.[1177] Mr. Randall expressed concern to the Board as to the lack of improvement, following which additional staff were added.[1178]

Consultancy Visits 2014

576. In late 2014, DRA conducted their first consultancy visit at Dreamworld whereby document management systems and document control structures were discussed with Management before a meeting held with the Safety Executive Committee.[1179] It was determined that the executive team would determine a suitable document management system for the storage of all Dreamworld documentation, and the Safety Department would be in charge of managing the updating of the procedures.

2015 Audit

577. On 13 and 14 July 2015, Mr. Randall from DRA conducted a Safety Management Systems Audit on Dreamworld, using the National Self Insurers Audit Tool. Given the limited timeframe, the audit focused on those criteria that did not gain a score of 3.0 in the last audit conducted in February 2014.[1180]

578. It was noted in the Executive Summary that significant improvements had been made with the implementation of the Safety Direct Management System, Liferay, a new LMS and the expansion of MEX ops.[1181] These introductions would allow for significant improvements in the automation of the safety management functions over the next 12 months to two years. Furthermore, a restructure of the Safety Unit at Dreamworld has enhanced services provided to the Departments. The Engineering Department had also made significant inroads into upskilling their staff and ensuring that training records were available for the inspection of rides. Full risk management reviews of the major attractions had also been commenced.

579. In addition to the strengths listed in the 2014 audit, the following further positives were also noted:[1182]

- *Safety Management System* – now readily available online to all staff.
- *Risk Management* – Quarterly inspections of departments, the development of corrective action registers for each department along with the development of a static risk register for each department has improved the risk management practices across the property.
- *First aid management* – is now approaching best practice with excellent facilities, highly trained staff and a comprehensive First Aid Procedures

[1176] Ex C5(35)(b), pg. 14
[1177] Ex C5(35)(b), pg. 15
[1178] Ex C5(35)(b), pg. 15
[1179] Ex F(8)(4); Ex F(8)(8); Ex F(8)(11)
[1180] Ex F(8)(3), pg. 2
[1181] Ex F(8)(3), pg. 2
[1182] Ex F(8)(3), pg. 2 & 3

Manual.

580. The areas for improvement largely mirrored that of the 2014 audit with the removal of the Safety Management System and Ride documentation. The additional area of concern was Emergency Management, which it was noted were out-of-date and did not accurately reflect the procedures undertaken within the Park for emergency situations.[1183]

581. In summary, the audit in 2015, yielded a final score of 61.6%, which was a significant improvement from the previous year.[1184]It was noted that with the imminent implementation of LMS, Liferay and the enhancement of MEX ops, significant automation of the safety functions could be achieved making the SMS resilient to change in staff. Furthermore, with Departmental Managers having clearly defined responsibilities, which are documented in the annual Safety Plan, safety will become a standard part of business rather than an 'add on'.[1185]

Consultancy Visit - April 2015

582. In April 2015, a further consultancy visit took place whereby the status of the recommendations from the audit conducted in January 2015 was reviewed with the continuous improvements within the Engineering Department and contract management noted.[1186] Further action in relation to the Emergency Procedures for rides were identified, which primarily involved the development of suitable picture based procedures to deal with all emergencies.

583. In relation to the Engineering Department, the following was noted:[1187]

- A review of work undertaken by the engineer on the documentation for the Wipeout and Buzz Saw clearly showed that significant work had been completed to ensure the rides could be inspected systematically to best practice standards based on manufacturers, Australian standards, ride bulletins and experience. This process was to continue with all high risk thrill rides being completed as a matter of priority, with one ride being completed per month.

- On the daily and weekly inspection sheets, the types of lubricants to be used for greasing to be included, as well as the tools required to complete the inspection.

- Supervisors to ensure all maintenance staff have completed the competency to operate the rides, as daily and weekly inspection procedures are developed.

584. DRA recommended that '*management consider engaging an external consultant to manage the AS3533 compliance issue associated with the introduction of new rides as part of the design registration process'*.[1188]

585. In terms of change management, DRA recommended that consideration be

[1183] Ex F(8)(3), pg. 2
[1184] Ex F(8)(3), pg. 2
[1185] Ex F(8)(3), pg. 2
[1186] Ex F(8)(5)
[1187] Ex F(8)(5), pg. 5 & 6
[1188] Ex F(8)(5), pg. 5

given to rotating Ride Operators during a shift, to ensure they remain vigilant when undertaking their functions.[1189]

Consultancy Visit - December 2015

586. In December 2015, a further consultancy visit took place where the progress of the implementation of the recommendations from April and July 2015 were considered.[1190]

587. In terms of actions undertaken, the report highlighted the following:[1191]

- Picture based emergency procedures had been developed for the five major rides by the Engineering Department.
- A lubricant register for each ride had been developed.
- A change management form in Safety Direct was available for use by staff.
- All corrective actions identified in the Safety Management System Audit conducted in July 2015 have been included in a corrective action register.
- Engineering were continuing to make progress with improving the documentation and systems of work related to ride operation and maintenance, with items that remained un-actioned detailed in an action plan.

588. In addition to a range of recommendations made about issues such as Hazardous Chemical Management, Emergency Procedures, Contractor Management and the Safety Management Plan, DRA also outlined the requirements of annual ride inspections per the OIR Regulations.[1192] The requirements of Form 8 and ss. 266 and 267 of the Act were explained. It was recommended that the following take place:[1193]

- Consider re-assigning the task of annual registration to the Engineering Department given they are deemed the person in control of the plant.
- Ensure an annual statement is obtained from either an external RPEQ Engineer or an internal competent staff member to state that the ride is safe for operation, the completed National Audit Tool for Amusement Devices would be sufficient to satisfy this requirement.

Consultancy Visit - April 2016

589. In April 2016, a further consultancy visit took place whereby a review of the progress of previous recommendations from prior consultancy visits and audits were considered.[1194]

[1189] Ex F(8)(5), pg. 6
[1190] Ex F(8)(9)
[1191] Ex F(8)(9), pg. 4
[1192] Ex F(8)(9), pg. 8
[1193] Ex F(8)(9), pg. 8 & 9
[1194] Ex F(8)(6)

590. The report prepared noted the following items of significance:

- Work had been ongoing in updating emergency procedures and ensuring Warden's boxes in each of the zones were fitted with suitable equipment.

- The annual inspection requirements for each of the attractions will now be completed by an external provider.

591. It was noted that *'given the transition in the Safety Managers role, it is understandable that many of the issues raised in the December report are yet to be formally addressed.'*[1195] Furthermore, the corrective action register was said to have listed all of the recommendations from previous audits, however, should be extended to include all from external/internal reports to ensure that there is a current log of risks available for review.[1196]

592. Relevant issues considered with further recommendations made were identified as follows:[1197]

- The corrective action register in Safety Direct to be used as the major tool for monitoring the implementation of the recommendations for those elements in the audit that were identified as below a score of 3.0.

- Locate resources within each department to ensure the requirements of the chemical management system are implemented prior to the November audit.

- In relation to emergency procedures, conduct a desk-top and other drills of key emergency procedures prior to the November audit with evidence of the drill outcomes available.

- The need for a comprehensive training needs analysis for each department, as this was one of the major non-conformances in all of the previous audits.

593. In April 2016, DRA were also requested to conduct a review of the Log Ride incident where a male patron was injured falling from the ride.[1198] The purpose of the review was to provide a further opinion as to the investigation process and findings to date, to compliment that already undertaken internally and by the Regulator, in order to ensure the safe reopening of the ride.

594. In addition to the further controls recommended for the ride, which included extra CCTV cameras and automatic audio safety warnings at critical points on the ride, DRA suggested that a *'full documented risk assessment of the ride be conducted',* which was intended to provide evidence of Dreamworld's primary duty of care, that both the current and proposed risk control measures are reasonable and have a timeframe for implementation which is reflective of the risk posed.[1199]

[1195] Ex F(8)(6), pg. 4
[1196] Ex F(8)(6), pg. 4
[1197] Ex F(8)(6), pg. 4 & 5
[1198] Ex F(8)(15)
[1199] Ex F(8)(15), pg. 2

Dreamworld's Response to DRA Audits

595. Following each audit and consultancy visit, a final report was produced by DRA, which would outline the findings made and recommendations.[1200] Mr. Randall presented his findings for each of the DRA reports to the Ardent Leisure Board by way of an Ardent Safety Committee meeting.[1201] To assist in the ongoing implementation of the recommendations following the audits, a Risk Register and Action Log was developed in December 2014, which was to be maintained by Dreamworld Safety staff.[1202]

596. It appears that the Safety Department were the custodian of the DRA audit reports. The recommendations, however, were shared with various Departmental Managers, including the Operations Department, so that corrective actions could be addressed.[1203]

597. According to Mr. Hutchings, Mr. Davidson was aware of the DRA findings and recommendations.[1204] He notes that not all of the recommendations made were implemented as it was '*purely a constraint issue*'.[1205] Regardless, it is clear that with the improved auditing scores, gradual improvements were being made by Dreamworld.

598. During the inquest, Mr. Randall stated that, *'I firmly believe had we gone through that process and had another, you know, three months, that some of these issues that have caused this event would have been identified and rectified'.*[1206]

Dreamworld Safety Auditing Strategy FY15[1207]

599. In May 2014, Mr. Deaves in consultation with Mr. Hutchings drafted a Dreamworld Safety Auditing Strategy for 2015.[1208] This document notes that the annual DRA audits, which is described as providing a comparison between the safety management systems as against the national self-assessment audit tool, have highlighted the absence of a formalised document control system.[1209] Whilst some improvements were noted in the 2013 and 2014, in order to improve the scores of the audits, it was proposed that the following strategies be implemented:[1210]

- Auditing strategy: It was proposed that the money spend on auditing ($14,000) be used to engage DRA as a consultant to assist in completing the work required, as identified by previous audits.

- Document control: It was noted that the Ardent IT Department had been working on a group wide document control solution for some years. Recently, a small module was made available to the Dreamworld Safety Department in order to deposit and manage Park wide safety policies and procedures. In order for the system to be complete, it was noted that a

[1200] Ex C4(16), pg. 2
[1201] Ex C8(10), pg. 66; Ex C4(16), pg. 2
[1202] Ex C4(16), pg. 2
[1203] Ex B3C(50), pg. 44 & 45
[1204] Ex C8(10), pg. 60
[1205] Ex C8(10), pg. 60
[1206] T24-69, lines 5-15
[1207] Ex B3C(46), pg. 102
[1208] Ex C8(26)(b); Ex B3C(46), pg. 102 & 103
[1209] Ex B3C(46), pg. 102
[1210] Ex B3C(46), pg. 102

module was required for each major Department.

- Engineering: Whilst it was noted that the preventative maintenance, inspection and training regimes had evolved over the operating life of the Ardent Theme Park Division, there was no formal evidence of compliance with the current system. As such, it was suggested that the following points for compliance be reviewed:

    - OEM Inspection and servicing requirements, including safety alerts and service bulletins.

    - Applicable Australian Standards compliance.

    - Queensland Regulation compliance assessed against the National audit tool.

    - Consolidation of historic information from JAK, DRA and internal audits. It was noted that this review would likely '*detail a large amount of recommendations that are currently not performed or partially performed*'.[1211]It was recommended that a junior engineer be recruited to undertake the following tasks:[1212]

        - Review each device and consolidate the information in the document control centre for retrieval by all relevant staff.

        - Assess the relevance of each task, negotiate with OEM on variations.

        - Manage change documentation.

        - Develop training plans and assessment tools based on the final service requirements.

600. Upon completion of the proposed review, it was further submitted that the process and inspection regime be independently verified for compliance, as this would provide a *'base line for any engineer's inspection to work from which is not an annual requirement of the Queensland regulation'*.[1213]

601. It appears that in April 2014, steps were taken to have the above proposal discussed between Mr. Deaves, Mr. Hutchings and Mr. Davidson.[1214]According to Mr. Deaves, this meeting took place whereby resourcing to assist Engineering in carrying out further audits on amusement rides was discussed following the identification of gaps in the safety systems management.[1215] This proposal was agreed to and further administrative support, as well as junior engineer, Mr. Cruz were subsequently hired to undertake the tasks as listed.[1216]

[1211] Ex B3C(46), pg. 102
[1212] Ex B3C(46), pg. 103
[1213] Ex B3C(46), pg. 103
[1214] Ex B3C(46), pg. 104
[1215] Ex C8(5), pg. 6 & 7
[1216] Ex C8(5), pg. 7 -14

CHANGES AT DREAMWORLD FOLLOWING THE INCIDENT

602. Material provided by Ardent Leisure during the inquest proceeding notes that a number of significant changes were made at Dreamworld following the tragic incident. The need for such changes to be made were expressed by Mr. Hutchings during an Ardent Leisure Board meeting, which took place on 7 December 2016, where he *'expressed his desire to replace human behavioural controls with engineering or monitored solutions'.*[1217] He further highlighted his intention to improve hazard identification and associated documentation. Below is a summary of the review, auditing and changes implemented since this tragic incident.

603. Shortly following the incident, Pitt & Sherry Operations Pty Ltd, an Australian Engineering firm with expertise in amusement devices and moving plant, were engaged by Ardent Leisure to inspect and assess the Amusement Devices and relevant associated components at Dreamworld and WhiteWater World.[1218] The scope of the work was to:[1219]

- Conduct a general safety review, utilising a team of engineers (Structural, Mechanical and Electrical and Control) including providing signoffs as part of a 3-Tier Review; and

- Conduct Annual Inspections on all Amusement Devices.

604. Following the above inspections, Pitt & Sherry issued an Annual Inspection Certification Letter for those devices found to comply with s.241 of the Regulations and AS3533.3. Corrective actions identified were outlined in reports provided for each ride.

605. In addition, Leisure Technical Consultants (LTC) were also engaged by Ardent Leisure to conduct its own Functional Tests and Peer Review of Pitt & Sherry's findings. These findings were outlined in detailed reports, which contained 160 recommendations and observations as to Corrective Actions.[1220] LTC found that the inspections conducted by Pitt & Sherry had been to a high standard.[1221]

606. The Engineering Department worked closely with Pitt & Sherry and LTC to facilitate their inspection of rides at the Park, and to complete remedial works on the matters identified by the Consultants.[1222]

607. In 2017, Pitt & Sherry were engaged by Ardent Leisure to conduct additional inspections and audits at Dreamworld and WhiteWater World to assess the work conducted in response to the Corrective Actions, as implemented by Dreamworld Technical Services.[1223]

608. In 2018, Ardent Leisure engaged Chapalex Pty Ltd, a company specializing in the integration of safety and risk management principles and practices into existing operational frameworks, to assist in gaining *'an understanding of the current status of work health and safety operating systems, policies and practices*

[1217] Ex C8(23)(f), pg. 1
[1218] Ex F4(1)
[1219] Ex F4(1), pg. 4
[1220] Ex F4(1), pg. 20
[1221] Ex F4(4), pg. 7
[1222] Ex F11, [17]
[1223] Ex F4(1), pg. 26

at Dreamworld and WhiteWater World'.[1224] Chapalex agreed to allow the Director, Mr. Phil Tanner, to undertake the role of Director of Safety at Dreamworld, WhiteWater World and Skypoint from 1 July 2018.[1225] Mr. Tanner was responsible for identifying opportunities to enhance the Park's existing WHS practices.[1226]

609. Whilst not exhaustive, other pertinent changes made throughout the Theme Park following the incident, include the following:

- Dreamworld staff were required to review applicable operating procedures for rides and attractions at the Park, in consultation with Pitt & Sherry to ensure that any modifications arising out of the reviews undertaken were incorporated into the Operating Procedures.[1227]

- Refresher training was provided to Ride Operators before the rides at the Park were reopened to the public.[1228]

- SP Solutions, external consultants with expertise in assisting companies identify, assess and control risks, were engaged to conduct workshops with Dreamworld staff and assist them in conducting risk assessments on rides at the Park.[1229]

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- A Memorandum Creation Procedure was introduced in the Operations Department, which requires consultation with the Attractions and Entertainment Manager, as well as a final sign off by either the Attractions Manager or General Manager of Park Operations, before it is disseminated to staff.[1230] According to Mr. Fyfe, following the incident, there is now a focus on 'risk assessment' and widespread consultation when creating memorandums.[1231]

- The configuration and members of the Safety Department were significantly changed to include an Engineering Safety Advisor, Safety Training Advisor, Environment Advisor and a Senior Safety Advisor.[1232]

- A number of safety initiatives were also introduced at the Park, including:

    - <u>*Emergency management plans*</u> - sets out the Park-wide response to various emergency situations, including for particular rides.[1233]

    - <u>*Scenario drills*</u> – a program was developed to be conducted on rides at the Park in consultation with Pitt & Sherry.[1234] Engagement was also commenced with the Queensland Fire and Emergency Services, QPS and OIR.

    - <u>*Park-wide Evacuation Drills*</u> – introduced to provide training to

[1224] Ex F11, [4] & [6]
[1225] Ex F11, [1]
[1226] Ex F11, [7]
[1227] Ex F11, [17]
[1228] Ibid.
[1229] Ibid.
[1230] Ex C8(6), pg. 16 & 17
[1231] Ex C8(6), pg. 29
[1232] Ex C6(51), [39]
[1233] Ex F11, [20]
[1234] Ex F11, [26]

staff as to how to proactively respond to emergency situations.[1235]

- o *Incident Controller* – a revised incident controller structure was implemented to provide situational leadership.[1236]

- o *Park-wide audio system* – enable more effective coordination of evacuation and personnel management during an emergency.[1237]

- A review of the health care able to be provided by the Park Health Facility was undertaken with necessary improvements actioned to achieve best practice.[1238]

- An analysis was undertaken as to the scoping and resourcing requirements of establishing an in-house Park training academy to canvas the operation of the Parks, with accredited training programs recognised Australia wide.[1239]

- A review was undertaken of the Ride Induction Training Program provided to new employees with improvements made.[1240]

- Implementation of new data management and IT Systems at the Park, which includes a new safety management system that consolidates previous systems into one single platform to control safety risks. A new document management system was also introduced, which efficiently and effectively tracks, manages and stores documents across all Departments.[1241]

610. Ardent Leisure have also developed a hazard and operability study (HAZOP) model for identifying and evaluating issues, which may present to staff, guests and rides at the Park. This risk assessment tool is intended to be the basis for any changes to the Regulatory regime in place in Queensland in response to this incident.

AMUSEMENT PARK REGULATION IN QUEENSLAND

611. The responsibilities of the Regulator for Amusement Park rides in Queensland is identified in the *Work Health and Safety Act 2011* (WHS Act) and *Work Health and Safety Regulation 2011*(the Regulations), which commenced on 1 January 2012.[1242] The implementation of this legislation gave effect to the national framework of model work, health and safety laws under the agreement of the Inter-Governmental Agreement for Regulatory and Operational Reform in Occupational Health and Safety.[1243] OIR are also responsible for administering the *Electrical Safety Act 2001* and the *Electrical Safety Regulation 2013* in conjunction with the Electrical Safety Office (ESO).[1244]

[1235] Ex F11, [32] – [36]
[1236] Ex F11, [37] – [39]
[1237] Ex F11, [40] – [45]
[1238] Ex F11, [48] & [49]
[1239] Ex F11, [51] – [58]
[1240] Ex F11, [59] – [61]
[1241] Ex F11, [69] – [78]
[1242] Ex F2A(3)
[1243] Ex F2A(3) [2]
[1244] Ex F2A(3) [3]

612. In administering this legislation, OIR is responsible for *'monitoring and enforcing the primary objectives of the WHS Act and ES Act to protect workers and other persons from harm to their health, safety and welfare through the elimination and minimisation of risk arising from work or from particular types of substance and plant'.*[1245]

Brief History of WHS Legislation - Past Decade

613. In 2011, the *Workplace Health and Safety Act 1995* and the *Workplace Health and Safety Regulation 2008* was repealed. The previous regulatory regime included a number of requirements relevant to amusement park rides in Queensland, such as general requirements for registrable plant and registrable plant design.[1246]

614. Plant design registration has been a feature of WHS legislation in Queensland for many years. It was intended to be a mechanism to ensure that the design of an item of plant had a verification statement confirming that it meet the technical standards and engineering principles appropriate for the plant.[1247]

615. In 2011, a nationally recognised set of model occupational health and safety laws were made to harmonise the different Australian jurisdictions. This model was adopted in Queensland in 2011, and commenced on 1 January 2012.

616. When Queensland adopted the model WHS laws in January 2012, it delayed the commencement of the five yearly renewal cycle for registration of items of plant and preserved the existing annual registration cycle due to operational and systems considerations. This is further explored below.

2011 WHS Act – Regulator Responsibilities

617. The WHS Act imposes a range of duties on persons and owners of plant (amusement devices), which are relevant to the design, maintenance and provision of safe plant. In discharging these responsibilities, OIR, as the Regulator of Amusement Parks, have three distinct functions:[1248]

- Administrative;
- Compliance monitoring and engagement; and
- Enforcement and sanctions.

Administrative Functions as of October 2016

618. The statutory regime administered under OIR includes requirements for plant registration and plant design registration, with certain classes of amusement devices requiring registration design and item registration. This has been a feature of the legislation in Queensland for many years, and was intended to check that the design of an item of plant had a complied with the published technical standards and engineering principles applicable to the plant.

[1245] Ex F2A(3) [4]
[1246] Ex F2A(3) [49] & [50]
[1247] Ex F9C(1)(a), [9]
[1248] Ex F2A(3) [6]

Plant Design Registration

619. Pursuant to s.259 of the Regulations, registration for plant design for a device is a one-off process, unless the design is altered or modified. [1249] Plant design registration requirements are generally consistent across all Australian jurisdictions.

620. There are currently 15 types of plant requiring design registration, which includes items such as amusement devices, cranes, lifts and pressure equipment. In particular, design registration for amusement devices is covered by s.2.1 of *AS3533 – Amusement Rides and Devices.*

621. The registration process consists of verification through several steps:[1250]

- Initial application consisting of design plans, technical standards and the assessment carried out by an independent competent person (a registered professional Engineer).
- Verification by the OIR Engineering Unit, which may include additional requests for information to address discrepancies.
- Should the Engineering unit remain concerned, an audit against the design and application is undertaken to ensure requirements are met.
- Design registration is only certified if the plants design satisfies this process and registration fees are paid.

622. Under the Regulations, the design verifier must be a competent person and must not have been involved in the production of the design or engaged by the design company at the time it was developed. A competent person for design verification, under s.252 of the Regulations, means a person who has the skills, qualifications, competence and experience to design the plant or verify the design. For Queensland, this means a suitably qualified and experienced RPEQ.

623. Items of plant requiring design registration under s.243 the Regulations are coordinated by the OIR Engineering Services Unit. When Theme Park Operators are planning to install new amusement devices, OIR's Chief Safety Engineer will provide input to ensure health and safety legislation and Australian Standard requirements are met.[1251]

624. The OIR Engineering Services Unit provides advice and strategic leadership on plant-related safety matters under the WHS legislation, as administered by OIR. This includes providing engineering support to the OIR investigation team when the incidents they are investigating involve the operation of plant, which include amusement devices.[1252]

Plant Registration Renewal

625. Separate to the design registration of a piece of plant, items of plant are then required to have their registration renewed annually. The OIR Licensing and

[1249] Ex F9C(1)(a), [11]
[1250] Ex F2A(3) [16]
[1251] Ex F2A(3) [14] – [15]
[1252] Ex C4(8), [3]

Advisory Services unit co-ordinates the items of plant requiring registration under s.246 of the Regulations. The registration involves a yearly application for plant registration, either lodged online or via a hardcopy using the requisite application form.[1253] A processing fee is applicable, following which a certificate of registration is provided.

626. For registration renewal of plant, the Regulator is not required to inspect the plant or verify any element of its safety as part of the process. Accordingly, the requirement to register items of plant is '*an administrative transaction between the person with management or control of the plant (e.g. the plant owner) and the regulator*'.[1254] The duty to inspect the plant rests with the plant owner and the registered professional engineer.

627. The registration of plant items provides OIR with a database, which records all of the location and owner details of plant items in the event that this information needs to be accessed following a safety concern.[1255]

628. For operational and OIR reasons, at the time of the national harmonisation in the work health and safety laws in 2012, Queensland did not move to the five yearly renewal cycle for plant registration provided under the model WHS laws.[1256] It seems that the primary reason for the delay in Queensland moving to the five year renewal period was the '*significant upgrade it would require to the Office of Industrial Relation's information technology system*'.[1257]

629. Current plant item registration requirements continue to differ amongst the States with annual registration renewal required in Queensland and NSW, with five year renewal for Tasmania, South Australia, Northern Territory, the ACT and the Commonwealth.[1258]

Safety Regulations for Plant

630. The regulation of plant safety, which is separate to the requirements for plant design and item registration, has significantly changed in Queensland over the past decade.

631. Prior to the implementation of the national model WHS laws, there were general workplace health and safety obligations in the *Workplace Health and Safety Act 1995* (repealed) on persons conducting business or undertaking; designers, manufacturers and suppliers of plant; erectors and installers of plant; owners of plant and persons in control of fixtures, fittings of plant in workplace areas.[1259] Generally, the obligations included providing and maintaining safe plant, ensuring the safe design of plant and to ensure the plant is maintained in a condition that ensures the plant is safe. The supporting *Workplace Health and Safety Regulation 2008* (repealed) was limited to control of high risk plant by way of registration of plant items and plant designs based on the list of plant in the National Standard for Plant. No other specific safety regulations for plant existed at the time.[1260]

[1253] Ex F2A(3) [8]
[1254] Ex F9C(1)(a), [23]
[1255] Ex F9C(1)(a), [24]
[1256] Ex F2A(3) [9]
[1257] Ex F9C(1)(a), [18]
[1258] Ex F9C(1)(a), [22]
[1259] Ex F9C(1)(a), [26]
[1260] Ex F9C(1)(a), [28]

632. Practical advice on managing risks were provided in the former Plant Code for Practice, which included guidance on inspection programs, frequency and documentation.[1261] The former Code stated that plant should be serviced and maintained in accordance with the manufacturer's specifications if applicable, and if not, in accordance with other proven and tested procedures.

633. The introduction of the national model WHS laws in Queensland in January 2012, provided more comprehensive regulatory provisions specifically related to the registration and maintenance of plant, including amusement devices.

634. The provisions relating to plant safety in the Regulations are contained within ss.204-213, and generally relate to the control of risks, proper use of plant, guarding, emergency stops and maintenance and inspection of plant.

635. Relevantly, ss. 210, 211 and 213 of the Regulations specifically state:

> **210 Operational controls**
> (1) The person with management or control of plant at a workplace must ensure that any operator's controls are –
> (a) identified on the plant so as to indicate their nature and function and direction of operation; and
> (b) located so as to be readily and conveniently operated by each person using the plant; and
> (c) located or guarded to prevent unintentional activation; and
> (d) able to be locked into the 'off' position to enable the disconnection of all motive power
> Maximum penalty – 60 penalty units.
> …
>
> **211 Emergency stops**
> (1) If plant at a workplace is designed to be operated or attended by more than one person and more than one emergency stop control is fitted, the person with management or control of plant at the workplace must ensure that the multiple emergency stop controls are of the 'stop and lock-off' type so that the plant cannot be restarted after an emergency stop control is reset.
> Maximum penalty – 60 penalty units.
>
> (2) If the design of plant at a workplace includes an emergency stop control, the person with management or control of the plant at the workplace must ensure that –
> (a) the stop control is prominent, clearly and durably marked and immediately accessible to each operator of the plant; and
> (b) any handle, bar or push button associated with the stop control is coloured red; and
> (c) the stop control cannot be adversely affected by electrical or electronic circuit malfunction.
> Maximum penalty – 60 penalty units.
>
> **213 Maintenance and inspection of plant**
> (1) The person with management or control of plant at a workplace must ensure that the maintenance, inspection and, if necessary testing of the plant is carried out by a

[1261] Ex F9C(1)(a), [29]

competent person.
Maximum penalty – 36 penalty units.

(2) The maintenance, inspection and testing must be carried out –
(a) in accordance with the manufacturer's recommendations, if any; or
(b) if there are no manufacturer's recommendations, in accordance with the recommendations of a competent person; or
(c) in relation to inspection, if it is not reasonably practicable to comply with paragraph (a) or (b), annually.

636. A 'competent person' for the purpose of s.213 of the Regulations is defined in Schedule 19 as, *'a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task'.*

637. In relation to the *control measures for amusement devices*, ss.238-241 of the Regulations are applicable.

638. Relevantly, ss. 238, 240 and 241 of the Regulations provide:

238 Operation of amusement devices
(1) The person with management or control of an amusement device at a workplace must ensure that the amusement device is operated only by a person who has been provided with instruction and training in the proper operation of the device.
Maximum penalty – 60 penalty units.

(2) The person with management or control of an amusement device at a workplace must ensure that –
(a) the amusement device is checked before it is operated on each day on which it is to be operated; and
(b) The amusement device is operated without passengers before it is operated with passengers on each day on which the amusement device is to be operated; and
(c) the daily checks and operation of the amusement device without passengers are properly and accurately recorded in a log book for the amusement device.
Maximum penalty – 36 penalty units.

240 Maintenance, inspection and testing of amusement device
(1) The person with management or control of an amusement device at a workplace must ensure that the maintenance, inspection and, if necessary, testing of the amusement device is carried out –
(a) by a competent person; and
(b) in accordance with –
(i) the recommendations of the designer or manufacturer or designer and manufacturer; or
(ii) if a maintenance manual for the amusement device has been prepared by a competent person, the requirements of the maintenance

manual.
Maximum penalty – 60 penalty units.

(2) A person is not a competent person to carry out a detailed inspection of an amusement device that includes an electrical installation unless the person is qualified, or is assisted by a person who is qualified, to inspect electrical installations.

241 Annual inspection of amusement device

(1) The person with management or control of an amusement device at a workplace must ensure that a detailed inspection of the device is carried out at least once every 12 months by a competent person.
Maximum penalty – 60 penalty units.

(2) An inspection must include the following –
(a) A check of information about the operational history of the amusement device since the last detailed inspection;
(b) A check of the log book for the amusement device;
(c) A check that maintenance and inspections have been undertaken under section 240;
(d) A check that any required tests have been carried out, and that appropriate records have been maintained;
(e) A detailed inspection of the amusement device to ensure compliance with the Act and this regulation (including a specific inspection of the critical components of the amusement device).

(3) The regulator may extend the date for an inspection by up to 35 days if an inspection is scheduled to coincide with the same event each year.

(4) If the date is extended under subsection (3), the new date is the date from which future annual inspections of the amusement device are determined.

(5) In this section –
Competent person means a person who –
(a) In the case of an inflatable device (continuously blown) with a platform height less than 9m- has acquired through training, qualification or experience the knowledge and skills to inspect the plant; or

(b) In the case of any other amusement device –
(i) Has the skills, qualifications, competence and experience to inspect the amusement device; and
(ii) Is registered under a law that provides for the registration of professional engineers; or

(c) Is determined by the regulator to be competent person.

(6) The regulator may, on the application of a person, make a decision in relation to the person for the purposes of subsection (5), definition *competent person,* paragraph (c) if the regulator considers that exceptional circumstances exist.

(7) An annual inspection under an equivalent provision of a corresponding WHS law is taken to be an annual inspection for the purposes of this section.

639. The current Regulation requires that the inspection of an amusement device pursuant to s.240 is to be carried out by a registered professional engineer with the appropriate skills, qualifications, competency and experience.[1262] This is a reflection of the consensus reached during the development of the national model WHS laws, that a competent person to inspect plant should have academic or vocational qualifications in a relevant engineering discipline and knowledge of technical standards.[1263]At the time, Engineers Australia recommended that a professional engineer should be the person who is competent to inspect plant due to the complexity and high risk nature of the plant.[1264]

Compliance Monitoring and Engagement

640. Mr. Michael Chan is the Director and Chief Safety Engineer, Engineering Unit for OIR, a position he has held since 2004.[1265] He is a Chartered Professional Engineer with more than 40 years' industry experience.[1266] He is a Registered Professional Engineer with the Board of Professional Engineers Australia. Mr. Chan is also a member of Engineers Australia at the fellow grade and is an Honorary Fellow of the Safety Institute of Australia.

641. As the Chief Safety Engineer, Mr. Chan is responsible for the design registration of high risk plant and also provides technical advice to the plant item registration function.[1267] He manages the Engineering Unit at OIR, which consists of six Engineers.[1268]

642. Recorded as ***assessments*** or ***advisories*** within the OIR case management system (CISr), OIR undertakes compliance monitoring and engagement both proactively and reactively.[1269] Assessments are conducted as workplace visits by inspectors to assess compliance with the relevant legislation, and may be planned proactively or as a response to a complaint or incident.

643. An ***advisory*** generally represents engagement activities undertaken to advise, inform and consult with the industry.[1270] This may include planned advisory interventions, industry forums or individual interactions between inspectors and workplaces.

644. Since 2002, OIR have conducted 8702 assessments pertaining to Theme Parks or amusement devices.[1271] Assessments have, on a yearly basis, increased from 547 to 697 a year (pre and post 25 October 2016).

645. A majority of these assessments were recorded as 'proactive' meaning that they were not linked to an event. Before 25 October 2016, OIR proactively inspected 4074 general amusement devices, and 2779 regional shows, school fete and festivals.[1272] 'Reactive' assessments, which are linked to an event or complaint prior to 25 October 2016, were carried out on 46 general amusement devices,

[1262] Ex F9C(1)(a), [35]
[1263] Ex F9C(1)(a), [36]
[1264] Ex F9C(1)(a), [36]
[1265] Ex F9C(3)(a), [1]
[1266] Ex F2A(4)(5), [2]
[1267] Ex F2A(4)(5), [4]
[1268] Ex F9C(3)(a), [5]
[1269] Ex F2A(3) [22]
[1270] Ex F2A(3) [25]
[1271] Ex F2A(4), pg. 1
[1272] Ex F2A(4), pg. 1

and 43 regional shows, school fete and festivals.

646. In relation to Theme Parks, 111 proactive inspections were carried out at Dreamworld prior to 25 October 2016, with 20 reactive inspections recorded.[1273] Following the tragic incident, 134 proactive inspections were conducted at Dreamworld, with 10 reactive inspections being carried out. Prior to 25 October 2016, 101 proactive assessments had been carried out at Movie World, with 18 reactive assessments.[1274]

647. OIR have also carried out 4,830 ***activities*** pertaining to Theme Parks or amusement devices since 2002.[1275] A majority of these (74%) were site visits largely at regional shows, school fetes and festivals. Mr. Chan gave evidence that a total of 128 amusement device incidents were reported in Australia from 2000 to September 2018. The analysis of data showed over 96% of those incidents related to mobile rides; 4% related to fixed rides at Theme Parks.

648. With respect to statutory notices issued to Theme Parks or amusement devices since 2002 up until the tragic incident, Dreamworld received 34 notices, the highest for all of the Theme Parks, and the Ekka.[1276]Movie World and Wet N Wild for the same period, received no notices. Following the 25 October 2016, 17 notices were served on Dreamworld, with Movie World receiving two and Wet N Wild receiving one.[1277]

649. During the inquest, Mr. Chan acknowledged that the Regulatory framework in place at the time of the incident in relation to amusement devices effectively expected Theme Parks to have developed and implemented safety management systems, including maintenance, operation, training and emergency control, with the qualified engineering and other staff to action it.[1278]

Industry Guidance & Engagement Activity

650. The OIR Chief Safety Engineer and Engineering Unit members meet with the major amusement device stakeholders (including Theme Park Operators) approximately twice a year, or as much as may be required due to emerging issues.[1279]An example would be a meeting which took place with staff at Movie World in 2015, following an incident involving critical bolt failures on the Green Lantern Ride.[1280]

651. As the Chief Engineer of OIR, Mr. Chan facilitated the development of the National Audit Tool for Amusement Devices in 2005.[1281] This Tool was intended to enhance the consistency and transparency of audit procedures for amusement devices, and covers all facets of maintenance and operation of amusement devices.[1282] Mr. Chan has also provided national training sessions on the application of the Audit Tool in Melbourne and Tasmania for WHS Inspectors from all Australian WHS regulators. The Tool has since been adopted

[1273] Ex F2A(4), pg. 1
[1274] Ex F2A(4), pg. 1
[1275] Ex F2A(4), pg. 2
[1276] Ex F2A(4), pg. 4
[1277] Ex F2A(4), pg. 4
[1278] T27-14, lines 15-35
[1279] Ex F2A(3) [27]
[1280] Ex F2A(3) [29]
[1281] Ex F9C(3)(a), [23(a)]
[1282] Ex F9C(3)(a), [23(a)]

by industry and all WHS Regulators around Australia.[1283]

652. Mr. Chan facilitated the development of a register as a database to record serious incidents involving amusement devices and enforcement notices issued by every Australian WHS Regulator on amusement devices.[1284] Since 2005, Queensland has been the custodian of the register, which is shared with all WHS Regulators in Australia. The data is collated and analysed annually and shared with industry stakeholders as performance graphs.[1285]

AALARA Forum

653. Since 2003, OIR have been associated with the Australian Amusement, Leisure and Recreation Association Inc. (AALARA).[1286] As the peak national body representing the amusement, leisure and recreation industry of Australia, AALARA is responsible for safety, operations and management.

654. At the annual conference convened by AALARA, a regulators and stakeholders forum chaired by OIR, to discuss safety issues affecting the amusement device industry is conducted (e.g. the development and implementation of the *National Audit Tool for Amusement Devices).* OIR works closely with AALARA to identify safety concerns and also publishes OIR information sheets (i.e. new regulations) and alerts (relating to amusement devices safety) on their magazines.[1287]

Annual Amusement Device Stakeholders Forum

655. Commencing in 2003, OIR hosts an Annual Amusement Device Forum, which includes Theme Park representatives, industry engineers and Interstate Regulators.[1288] The information presented canvas various topics, including recent safety incidents and issues with amusement devices, as well as learning the outcomes resulting from OIR audits of amusement rides, revision of the Australian Standards and design registration requirements.

Functional Safety Forum

656. On 9 August 2016, OIR held a Functional Safety Forum, which included Theme Park representatives, functional safety engineers and Interstate Regulators.[1289] The forum focused on the validation procedures for safety controls systems of plant (i.e. what the validation process includes, engineering qualifications required, and the OIR auditing process).

Published Guidance Material

657. The following Safety Alerts have been published by OIR as a consequence of a number of incidents involving amusements rides:[1290]

- 2009 Safety Alert – Risk of being hit by moving parts of an aerial amusement ride;

[1283] Ex F9C(3)(a), [23(b)]
[1284] Ex F9C(3)(a), [23(c)]
[1285] Ex F9C(3)(a), [23(d)]
[1286] Ex F2A(3) [30]
[1287] Ex F2A(3) [32]
[1288] Ex F2A(3) [33]
[1289] Ex F2A(3) [34]
[1290] Ex F2A(3) [35]

- 2010 Safety Alert – Inflatable water balls;
- 2013 Safety Alert – Safety of amusement rides;
- 2015 Safety Alert – Re-design of rider restraint systems on amusement devices; and
- 2015 Safety Alert – Setting up and dismantling of amusement rides.

658. Post the tragic incident, OIR have published a number of Safety and Incident Alerts, including:[1291]

- 2017 Incident Alert – Child injured after jumping castle became airborne;
- 2017 Safety Alert – Uncontrolled starting of amusement device; and
- 2018 Safety Alert – Inflatable water balls – electrical equipment near water.

659. Provided by Safe Work Australia as information for the public, nine packages of national guidance material to support the WHS Act 2011 and the WHS Regulations 2011 were published on the OIR website. Of the nine packages, one was the relevant *Amusement Devices General Guide.*[1292]

660. For guidance on complying with obligations under the WHS Act, industry participants may refer to the *'Managing risks of plant in the workplace – Code of Practice 2013'.* The Code was established under s.274 of the WHS Act and may be used in proceedings as evidence of whether or not a duty or obligation under the Act has been complied with.[1293]The Code provides advice on the safe use of plant and references technical standards that provide guidance on the design, manufacture and use of certain types of plant.[1294] For amusement devices the Code references *Australian Standard AS3533.1 – 2009: Amusement Rides and Devices for design, manufacture and use.*

Enforcement & Sanctions

661. OIR enforces compliance with obligations owed under statutory regime consistent with guidance published in the *Safe Work Australia National Compliance and Enforcement Policy.*

662. Enforcement responses include the issuance of statutory notices requiring contraventions be remedied, unsafe activities prohibited and unsafe equipment not be used. In addition, enforcement may involve monetary fines, prosecution of offenders through the judicial system, and revocation or alteration of licenses issued by the regulator.

Compliance Notices

663. OIR introduced an Enforcement Note in March 2012. This instructed inspectors

[1291] Ex F2A(3) [36]
[1292] Ex F2A(3) [37]
[1293] Ex F2A(3) [38]
[1294] Ex F2A(3) [38]

on the use of prohibition notices under s.195 of the Act, when resolving contraventions relating to plant without design registration.[1295]This Note was subsequently withdrawn in December 2015, and appropriate instructions were issued to Inspectors supported by training in the use of the s.191 Act.

Investigations

664. Records suggest that there have been 68 comprehensive investigations undertaken by OIR at the Theme Parks.[1296]

Prosecutions

665. In 2016, a prosecution was commenced by OIR against one of the major Theme Parks for failing to adequately assess the hazard of metal fatigue, which resulted in one patron sustaining a minor laceration to the forehead.[1297] The company received a penalty of $25,000, with the ride being subsequently dismantled and removed from service.

666. In 2017, the prosecution of two matters relating to amusement rides were decided:[1298]

- The first matter involved an inflatable jumping castle, which was dislodged. A penalty of $15,000 was imposed.

- The other matter involved a worker who was fatally injured when dismantling an amusement ride. The company received a penalty of $80,000.

667. From June 2011 until the fatal incident in October 2016, OIR had undertook nine investigations involving amusement devices at shows and school fetes. As of October 2016, eight had been finalised with one matter before the court (this has since been finalised).[1299]

668. OIR reports that seven matters were successfully prosecuted with penalties ranging from $500 to $40,000 and four of the seven penalties were in excess of $25,000.[1300] These prosecutions involved fracture and head injuries where the rider was ejected from the amusement device, and in one case, a worker sustained crush injuries when trapped by moving machinery.

Regulatory Focus on Mobile Amusement Rides

669. Prior to the tragic incident at Dreamworld in 2016, OIR's efforts to monitor compliance for amusement devices had been focused on amusement devices at major agricultural shows, local carnivals and school fetes.[1301] This was due to the mobile nature of the amusement devices at these events, in addition to their frequent erection and dismantling. Furthermore, due to the transient nature of the operations, it was reported to be difficult to regulate without significant

[1295] Ex F2A(3) [41]
[1296] Ex F2A(3) [42] & Annexure 4
[1297] Ex F2A(3) [44]
[1298] Ex F2A(3) [45]
[1299] Ex F2A(3) [46]
[1300] Ex F2A(3) [47]
[1301] Ex F2A(3) [59]

resource allocation.[1302]

Previous Notifications Made to OIR in Relation to the TRRR by Dreamworld

670. OIR records clearly show that since the approval of the design of the TRRR on 14 August 1987, there have been **no notifications** made by Dreamworld as to the ride being altered or modified as part of the design registration process.[1303]

CLASS 2 RIDES INSPECTION & REGISTRATION

671. From 1999, all data records relating to plant item registration were stored by OIR electronically in the Plant Admin System.[1304] Records relating to the TRRR since this time confirm that the requisite renewal applications were submitted up until 2015.[1305]

672. In 2015, OIR undertook a review of the processes that supported plant item registration, as plant and financial records were identified as requiring a significant cleanse.[1306] After the due date for the registration renewals of 31 January, there were a number of business processes to be completed before the list of plant owners with outstanding registration renewals could be compiled. Approximately, 2,400 renewal applications are made each year via hard copy application forms, rather than electronically. These forms are manually entered into the system via an online portal by a third party contractor.[1307] In February, invoices for registration fees are issued for those with unpaid renewal applications received between 1 December and 30 January.

673. Records suggest that in 2016, approximately 5,400 renewal forms were sent out, which covered 30,000 pieces of plant in Queensland.[1308]

Dreamworld's Compliance with the Requirement for Renewal of Plant Registration

674. Following the introduction of the harmonised legislation in 2012, particularly s.241 of the Regulations, it does not appear that there was a conclusion reached amongst Dreamworld's management as to how compliance for the renewal of plant registration would be achieved.[1309] Legal representatives for Ardent Leisure advised OIR during the audit process undertaken as a result of this tragic incident that the following 'system' approach was adopted to the requirement for a 'competent person' by Dreamworld, which encompassed the following:[1310]

- Our Chief RPE Bob Tan who oversaw the system (a veteran Amusement Park RPE of 28 years' experience).
- Maintenance and inspection regimes based around:
    - OEM recommendations

[1302] Ex F2A(3) [60]
[1303] Ex F9C(3)(a), [9]
[1304] Ex F9C(2)(a), [3]
[1305] Ex F9C(2)(a), [8]
[1306] Ex F9C(2)(a), [90]
[1307] Ex F9C(2)(a), [92]
[1308] T27-60, lines 30-35
[1309] T29-63 & 64
[1310] Ex F9C(8)(6)(b), pg. 44 & 45

- Trend analysis
- Industry advice
- Regulatory bulletins and documents

- A tiered approach to on-site engineering personnel undertaking inspections (e.g. qualified trades, Team Leaders, Supervisors and Senior Managers – all of whom are trained and assessed as competent to undertake maintenance tasks, including annual maintenance inspections).

- Periodic inspections intervals based on modern and more current condition monitoring equipment for acute failure detection.

- Use of local and international audit professionals to audit all facets of:

    - Management policy
    - Compliance with local laws, standards, industry bulletins etc.
    - Document control
    - Training and competence
    - Accuracy of inspections
    - Change management policy
    - Ride operation
    - Technical integrity

- This systematic approach assists with:

    - Compliance with the national regulators auditors tool
    - Compliance with OEM inspections
    - Fitness for purpose on all repairs/inspections
    - An auditable system of non-routine defects

675. Whilst Mr. Tan was never RPEQ certified, there seems to have been an assumption made within Dreamworld that his 'expertise' was sufficient to certify the rides for annual registration renewal.[1311]In relation to the required annual inspection of the amusement devices pursuant to the Regulation, Mr. Tan was aware that this had to be done by a 'competent person', however, this did not mean an RPEQ.[1312] After the changes to the Regulations were made in 2012, Mr. Tan stated that despite conversations with Mr. Deaves, there was no conclusion reached within Dreamworld as to how the annual inspections conducted would comply with the new requirements.[1313] Accordingly, the same process was followed through the annual and periodic inspections of the amusement devices at Dreamworld by members of the E&T Department.[1314] He stated during the inquest that it was not his responsibility to action the annual renewal applications for plant registration, as this was a matter for the Safety Department.[1315] Rather, Mr. Tan was involved in the initial registration, as this was a more rigorous process, including close communication and coordination with the manufacturer.[1316]

[1311] T22-79, lines 1-15
[1312] T29-59, lines 3-36
[1313] T29-64, lines 8-34
[1314] T29-60 & 61
[1315] T29-62, lines 18-25; 30-37; T29-86 & 87
[1316] T29-62, lines 18-25

2016 Dreamworld Plant Registration

676. On 16 December 2015, plant registration renewal forms for the 2016 registration period were sent to Ardent by a third-party processing provider.[1317] Payment for registration of 25 amusement devices were made by Ardent on 25 February 2016, however, no completed registration applications were received.

677. On 29 July 2016, OIR sent correspondence to Dreamworld reminding them of the requirement to renew registrable plant by a competent person, per the requirements of the Regulation.[1318] It was noted that the application for renewal of the amusement devices was incomplete, and all of the amusement devices at Dreamworld were unregistered.[1319] A 28 day period from the date of the letter to complete the registration renewal process was provided.[1320]

678. On 11 August 2016, OIR Chief Engineer, Mr. Chan, with OIR Principal Advisor, Mr. Terry O'Sullivan from the Engineering Unit, met with Mr. Deaves and Mr. Hutchings to discuss plant item registration requirements under the Regulation for amusement devices at Dreamworld.[1321] The purpose of the meeting was to discuss ss.240 and 241, in particular the requirement of a competent person to conduct annual inspections on registrable amusement devices. According to Mr. Chan, Mr. Deaves and Mr. Hutchings explained that whilst Dreamworld had implemented comprehensive maintenance, inspection and testing regimes on all amusement rides at the Park, they had not engaged a registered professional engineer to conduct annual inspections pursuant to the requirements of s.241 of the Regulations.[1322] As such, Dreamworld were not able to register their amusement devices.

679. Mr. Deaves and Mr. Hutchings proposed that Dreamworld be exempt from needing to engage a registered professional engineer under s. 241(5)(b) of the Regulation, and in lieu OIR accept that an effective 'in house maintenance and inspection system' had been implemented.[1323] Mr. Chan claims that he advised them that such a proposal was not acceptable pursuant to the Regulations, and that the annual inspection must be performed by a suitably qualified and experienced person and not by a *'in-house maintenance, inspection and testing system'*.[1324]

680. On behalf of Dreamworld, Mr. Thompson subsequently sent a letter to OIR via email on 16 August 2016, stating the following:[1325]

> *At the time of renewal, Dreamworld was of the belief that compliance with s241 of the Regulations (2011) had been achieved. Our continuous maintenance programme utilises in-house professional Engineers and a range of external professional Engineers to undertake the required annual inspections. It was felt that this combination of engineering expertise was sufficient to meet the definition of "competent*

[1317] Ex F2A(3) [10]
[1318] Ex B12(17)
[1319] Ex F2A(3) [11]
[1320] Ex F2A(3) [11]
[1321] Ex F2A(4)(5), [5]
[1322] Ex F2A(4)(5), [7]
[1323] Ex F2A(4)(5), [9]
[1324] Ex F2A(4)(5), [10]
[1325] Ex B12(17), pg. 8

person".

Since this time, we have held in-depth discussions with OIR Chief Engineer Michael Chan regarding the definition of "competent person". In particular, our current combination of Engineers lacks the registered professional engineers (RPE) certification and hence does not meet the definition of competent person.

We acknowledge this technical non-compliance and have been working quickly to identify an appropriate RPE who can undertake the necessary inspections and sign-off. Our RPE can commence the inspections in early September and have them concluded by the end of September (there are some 35 amusement devices in the Dreamworld fleet).

Accordingly, we would respectfully ask for an extension of time to undertaken these assessments in order to comply as quickly as possible with s.241. In the meantime, our continuous maintenance programme provides many layers of safety inspection to ensure the on-going safety of all patrons.
…

681. During the inquest, Mr. Thompson claimed that he had been provided with the initial correspondence from OIR by Mr. Deaves. There was some subsequent discussion between himself, Mr. Deaves and Mr. Hutchings as to which Department within Dreamworld was actually responsible for ensuring the plant remained registered.[1326] In relation to the letter that was sent to OIR under Mr. Thompson's hand requesting an extension, he claims that Mr. Hutchings had in fact drafted that letter following discussions about the registration requirements with Mr. Deaves.[1327]

682. Following receipt of the request for an extension, Mr. Chan discussed the matter with Ms. Johanna Sutherland from the Licensing and Advisory Service Unit, OIR.[1328] He recommended that the extension be granted on the basis that *'on my knowledge of Dreamworld's maintenance, inspection and testing regime and that a delay of a few months for a professional engineer to progressively conduct annual inspections will not introduce significant risks to Dreamworld's continued operation'*.[1329] During the inquest, Mr. Chan clarified that whilst he did not have detailed knowledge of the maintenance of individual rides at Dreamworld, he had previously had discussions with Mr. Deaves, with whom he had a long standing professional relationship, about the existence of their inspection and testing program, and this was the basis of his recommendation.[1330]

683. Dreamworld were subsequently granted an extension until 30 September 2016, to inspect and assess their plant items for the purpose of the registration renewal.[1331]

684. On 29 September 2016, a further email was sent by Mr. Thompson to Mr. Chan

[1326] T6-45, lines 23-35
[1327] T6-46 & 47
[1328] Ex F2A(4)(5), [13]
[1329] Ex F2A(4)(5), [14]
[1330] T27-21, 22 lines 1-12
[1331] Ex B12(17), pg. 6

advising that whilst Dreamworld had been able to engage someone to inspect the smaller rides, they had struggled to find a "competent person" to inspect the 'Big 9 rides'.[1332] A further extension until 1 December 2016, for compliance with s.241 of the Regulation was requested. It was noted in the correspondence that the TRRR had been inspected by this date by a "competent person".[1333] Mr. Chan recommended that the further extension sought by Dreamworld be granted on the basis that it would allow the Park to continue its business with some of the 'unregistered' amusement devices in operation whilst others ceased for the engineer to conduct the required inspections.[1334]

685. In August 2016, Mechanical Registered Professional Engineer (RPEQ), Mr. Tom Polley from Tom Polley - Machinery Inspection Services, was engaged by Mr. Deaves to carry out Class 2 Annual Inspections on rides at Dreamworld, including the TRRR.[1335] Initial correspondence sent to Mr. Polley from Mr. Deaves states the following:[1336]

> *…*
> *Our business has been having discussions with WPH&S about the competent person and accountabilities under the regulation for annual inspections.*
>
> *The preferred model for us would be to make the business as an entity accountable for the auditing of the appropriate professionals required to ensure safe operation of equipment.*
>
> *As you know the Queensland regulation is written and at this time does not allow for this option. In order to maintain plant registration we are required to have our rides inspected before the end of September. Is this a service you could provide for us in the time frame available.*
>
> *Attached is a list of equipment. Many of the rides are small and our documentation is good….*

686. Mr. Polley, who has experience in the amusement ride industry since 1992, agreed to conduct inspections for the Class 2 rides on 12 September 2016, charging a rate of $1200 per day.[1337] He indicated that he would need to inspect the ride and view documentation. Mr. Polley was subsequently provided with plant registration numbers for some of the rides by way of a spreadsheet.[1338] He did not request to see, and was not shown, the current Certificate of Registration for each item of plant he was asked to inspect.[1339]

687. Mr. Polley states that he requested from Mr. Deaves and Mr. Cruz maintenance documentation of all the Class 2 Rides for the past 12 months, in order to assist him in completing his inspections and subsequent reports.[1340] He claims that during conversations as to these documents, he was advised that Dreamworld had been focusing on getting their maintenance documentation up to an

[1332] Ex B12(17), pg. 4
[1333] Ex B12(17), pg. 2 & 3
[1334] Ex F2A(4)(5), [15] & [16]
[1335] Ex B3A(23), [5]; Ex F9C(8)(9)(c), pg. 1
[1336] Ex F9C(8)(9)(c), pg. 1
[1337] Ex F9C(8)(9)(d), pg. 1
[1338] Ex F9C(8)(9)(g), [3]
[1339] Ex F9C(8)(9)(g), [8] & [9]
[1340] Ex B3A(23), [7]; Ex F9C(8)(9)(g), [6]

acceptable level for the Class 5 rides, which are the bigger thrill rides.[1341] As such, he was told that there was no maintenance documentation available.[1342] He subsequently requested from Mr. Cruz records as to the annual inspections conducted previously.[1343]

688. In relation to the TRRR, Mr. Polley claims that he did not receive any completed maintenance documentation or log books, rather he was provided with a blank Daily and Annual Inspection Schedule via email.[1344] Mr. Polley was advised that there had been no issue with the TRRR for the past 12 months, and that there was no current maintenance documentation due to the effort being put into the Class 5 rides.[1345]

689. According to Mr. Cruz, Mr. Polley was provided with the '*entire maintenance program'*, for each of the rides he was asked to inspect.[1346] At inquest, Mr. Cruz clarified this to mean a copy of the preventative maintenance checklists for the daily, weekly and monthly inspections, leading up to the annual shutdown.[1347] He does not recall providing Mr. Polley with maintenance records, including down-time reports.[1348] At Mr. Deaves request, Mr. Cruz accompanied Mr. Polley around each of the rides as he carried out his inspections and outlined the daily inspection checks undertaken for each ride.[1349]

690. In relation to the TRRR, Mr. Cruz gave evidence that the only information he provided Mr. Polley was the preventative maintenance checklists.[1350]

691. On 29 September 2016, Mr. Polley attended Dreamworld and conducted a visual inspection of the TRRR, which was limited to the mechanical and structural aspects of the ride, and did not include the electrical or operational systems.[1351]

692. Despite being the Ardent Group Safety Manager, Mr. Hutchings had no involvement with engaging Mr. Polley.[1352]

Certificate Issued for TRRR

693. An *Annual Mechanical and Structural Inspection Certificate/Report 39/16* (the Certificate) was subsequently issued by Mr. Polley for the TRRR, which was dated 17 October 2016.[1353] This certificate states that no faults were found with the following:

- Operational history since the last detailed inspection;
- Log book; and
- Inspection, including accessible critical components.

[1341] Ex B3A(23), [8]
[1342] Ex F9C(8)(9)(g), [6]
[1343] Ex F9C(8)(9)(g), [6]
[1344] Ex B3A(23), [9]
[1345] Ex B3A(23), [10]
[1346] Ex B3C(53), pg. 25 & 26
[1347] T11-102, lines 37-45
[1348] Ex B3C(53), pg. 26 & 27
[1349] Ex B3C(53), pg. 27; T11-102, lines 20-45
[1350] T11-102, lines 40-45
[1351] Ex B3A(23), [11]
[1352] Ex C8(10), pg. 26
[1353] Ex F9C(8)(9)(h)

694. The following recommendation and faults were found with the TRRR:[1354]

- *Recommendation 1:* **Anti Roll Back Gate** – Consideration should be given to introducing a scheduled inspection in the *Daily Pre-Service Inspection* for the anti-roll back gates as the top gate remained open when it should have automatically closed.

- *Fault Found 1:* **Anti-Roll Back Gate** – The top gate automatically closing mechanism is not working and must be repaired.

695. The Certificate notes that:[1355]

> **Statement**
>
> A visual inspection of the device (including a specific inspection of visible mechanical and structural critical components) has been completed. This inspection did not include an electrical inspection.
>
> In my opinion, this device was mechanically and structurally safe to use at the time of inspection provided the above *Recommendation* is appropriately considered and the above *Fault Found* is repaired.

696. Mr. Polley claims that despite a lack of maintenance documentation, he was able to conduct a visual mechanical and structural inspection of the TRRR, based on '*my observations of issues like oil leaks, wear, cracking, and signs of corrosion, together with assertions given to me by park maintenance personnel that there had been no mechanical or structural issues with the ride in the past 12 months'.*[1356]

Draft Report for all Class 2 Rides

697. On 24 October 2016, Mr. Polley sent via email, a draft report to Mr. Deaves and Mr. Cruz with general findings following the annual inspections carried out of all of the Class 2 devices.[1357]

698. The draft report outlines generally the applicable OIR legislative framework for amusement device registration. The following limitations of Mr. Polley's annual mechanical and structural inspections are stated as follows:[1358]

- Visually inspecting accessible mechanical and structural components and accessible critical components of individual devices in the presence of Dreamworld technical staff for:
    - Cleanliness including fluid leaks;
    - Wear;
    - Cracking;

[1354] Ex F9C(8)(9)(h), pg. 2
[1355] Ex F9C(8)(9)(h), pg. 2
[1356] Ex B3A(23), [15]
[1357] Ex F9C(8)(9)(i), pg. 7
[1358] Ex F9C(8)(9)(i), pg. 3

- Signs of corrosion; and
- Signs of buckling, permanent deformation, paint cracking, paint flaking or other indications of stress beyond the yield point.

- Perusing a selection of computerised and hard copy maintenance records for individual devices.

- Visually observing electrical issues, however, my annual inspection did not include a detailed electrical inspection. Of note, a detailed electrical inspection should be carried out by a qualified electrical person.

Of note, my annual inspection did not extend to:

- Assessing the competence of technical and operational staff to run the devices;

- A full audit of pressure equipment against the design registration and plant registration requirements of *Schedule 5 of Work Health and Safety Regulation 2011,* nor did it extend to a full audit against the inspection requirements of *AS 3788-2006, Pressure equipment-In-Service equipment;* and

- An assessment of bolting hardware and bolting techniques used in critical bolted connections.

699. In relation to ***General Findings of the Annual Inspections***, Mr. Polley noted that a daily inspection schedule was available for most devices, with a yearly inspection schedule available for some.[1359] Furthermore, processes were in place and had commenced for reviewing and updating current inspection schedules for the Class 2 devices, as had been done on the higher class rides.[1360]

700. Mr. Polley noted a number of ***Recommendations*** in his Draft Report, including the following:[1361]

- ***Inspection schedules:*** The organisation should continue, on a risk assessment basis, reviewing all inspection schedules. All devices should have a daily and annual inspection schedule and an analysis should be undertaken to determine the need for any weekly, monthly, three monthly and six monthly scheduled inspections or any other special inspections not based on calendar parameters.

[1359] Ex F9C(8)(9)(i), pg. 4
[1360] Ex F9C(8)(9)(i), pg. 4
[1361] Ex F9C(8)(9)(i), pg. 4 & 5

- *Documentation following Servicing, Repair and Maintenance:* The organisation should introduce a formal procedure for checking all documentation is in order prior to returning a device back to normal use following servicing, repair or maintenance.

- *Class of Device:* As part of the review of all inspection schedules, the organisation should establish the current Class 2 for the rides inspected is correct in accordance with the Classification requirements of *Australian Standard AS-3533.1.* The organisation should also record the parameters used to establish the class of ride.

- *Dead Man controls:* On a risk assessment basis, each device should be assessed on the need for Operator dead man controls and if required, modifications should be introduced on a priority basis as determined by the risk assessment. Appropriate testing requirements should also be introduced as required.

701. In conclusion, Mr. Polley stated that:[1362]

> In my opinion the organisation will have an acceptable maintenance regime in place once it satisfactorily addresses the *Recommendations* above including the upgrade and implementation of all inspection schedules for the Class 2 devices.

702. Individual certificates were subsequently provided for each of the Class 2 Rides.

703. At the time of the incident, Dreamworld had engaged Pitt & Sherry, a Specialist International Engineering company, to carry out inspections on the major thrill rides.[1363] Representatives from the company were on-site inspecting other rides the day of the tragic incident.

704. Records from OIR confirm that the registration process for all of the amusement devices were completed by 24 January 2017.[1364]

OIR INSPECTOR AUDITS OF DREAMWORLD PRIOR TO THE INCIDENT

705. Between 2002 and 25 October 2016, the Regulator conducted a number of compliance activities for Dreamworld and WhiteWater World, which consisted of:[1365]

- 38 investigations (interventions with duty holders in response to a notifiable incident, complaint or request for assistance);

- 111 assessments (interventions with duty holders to monitor compliance and record enforcement actions, and in response to a notifiable incident);

- 36 notices (records of the issue of statutory notices to duty holders); and

[1362] Ex F9C(8)(9)(i), pg. 5
[1363] Ex B3C(53), pg. 28
[1364] Ex F2A(3) [13]
[1365] Ex F17(a), pg. 1-3

- 10 advisories (records of inspector interactions with duty holders where there is no anticipation of any compliance action being taken).

706. Principal Inspector Ian Baker, who has been employed by OIR for over 26 years and involved in the inspection of high risk plant at Amusement Parks since 1990, notes that he has always had a productive and professional relationship with Dreamworld.[1366] He notes that in his experience, the safety practitioners and Engineering Management at the Park have always been receptive to advice and suggestions made by OIR in relation to any safety matter. He has undertaken numerous site visits to Dreamworld, which were both reactive and proactive, estimating that on average he has attended site approximately once a month.[1367] Prior to 2014, Mr. Baker recalls that when he attended site, he used to have extensive contact with Mr. Tan.[1368] The last time he attended site for an OIR audit was 3 March 2016.[1369]

707. During the inquest, Mr. Baker stated that he had never seen the Operator Procedures nor any documentation in relation to repairs and alterations of the TRRR.[1370] He had also not inspected the conveyor of the TRRR during a safety audit at Dreamworld.[1371] When shown photographs of the trough of the ride, including the end of the conveyor and steel support railings at the unload area, Mr. Baker acknowledged that there was a 'nip point' and that he would have been 'concerned' had he observed the area in this manner.[1372] He noted that when OIR Inspectors were attending site to carry out a safety audit, they weren't closely examining the construction and integrity of the amusement device unless a specific complaint had been received.[1373] Furthermore, there was no concentrated effort to determine whether a piece of plant had been modified or altered without notification made to the Regulator.[1374]

708. In relation to the actions taken specifically for the TRRR by the Regulator prior to the incident, the following was noted:[1375]

- *18 November 2003:* Two assessments were undertaken as part of a major audit program coordinated by Inspector Ian Baker, for which the TRRR was considered by three inspectors.

  Notebook recordings of the findings made for these assessments state that this was a large plant audit for which the Theme Park was viewed during a walk around.[1376] The TRRR was physically inspected, as was documentation pertaining to the ride. It was noted that *'no breach of the WH&S Act could be identified*'.[1377]

- *12 October 2014:* A Hazard Specific Workplace Assessment was conducted by Inspector Ian Baker (35774) which was in response to an un-notified incident on 7 October 2004, where rafts collided in the

[1366] Ex C4(10), [6] & [7]
[1367] Ex C4(10), [9] & [10]
[1368] Ex C4(10), [12]
[1369] Ex C4(10), [16]
[1370] T28-55, lines 25-47
[1371] T28-49, lines 32-47
[1372] T28-50, lines 5-25
[1373] T28-51, lines 38-45
[1374] T28-52, lines 25-35
[1375] Ex F17(a), pg. 3
[1376] Ex F17(a), pg. 12
[1377] Ex F17(a), pg. 12

unloading area and a female guest fell into the water as she was disembarking from the raft.

The site visit took 1 ½ hours. Notebook recordings of the findings of investigators state that, *'assessment re safe load & unload procedures. E-Stop fitted at debarkation point. CCTV to monitor point. Electronic stop & release system is being upgraded. 2nd gate option currently being investigated'.*[1378]

709. Records provided by Ardent Leisure confirm the OIR safety inspections conducted in 2003.[1379] Prior to the audit of Dreamworld, meetings were conducted with Inspectors from OIR in order to establish the parameters of the pending audit.

710. Commencing on 18 November 2003, 24 inspectors from OIR attended Dreamworld to conduct the safety audit. This lasted four days, with each group of Inspectors being accompanied by a Dreamworld team member, Mr. Bob Tan, Mr. John Angilley, Mr. Steve Corrie and Mr. Russell Reed.[1380] I note in the submissions from the OIR, referring to their document relating to that inspection, there is a reference to electrical GPO's needing to check inside the pump area of the Rapids ride. The OIR goes on to mention that at the time of the inspection, "the support rails were placed as close as possible to the end of the conveyor; thereby limiting the gap and potential to identify any nip point which may have been evident at the time." I do not accept this submission. The OIR concede in their submission that Inspector Baker "had not personally looked at the TRRR as a safety audit or for safety aspects of it. On all occasions that Mr. Baker went to Dreamworld, he did not see the TRRR not operating and the water drained from the system."

711. I find this admission alarming. Especially when considered against the evidence of the independent engineers, and indeed the findings of the inspectors from OIR who attended the scene after the accident, who all agree that the placement of the support rails in proximity to the end of the conveyor created an obvious nip point, as did the spacing between the rails of the conveyor, in contravention of the Australian Standards, and an extreme danger to the passengers in the rafts.

712. I find that had the TRRR been inspected, in its design, condition and layout at the time of the fatal incident, by a properly qualified engineer this serious and highly dangerous situation would have been prevented and the ride closed. Especially against a background of constant breakdown of the water pumping system in place causing regular and frequent drops in the water level, a situation well known to the owners and Operators of the ride as well as inspectors from the OIR.

713. The OIR were also involved with the amusement industry in assisting and consulting extensively with industry stakeholder groups to enhance safety of amusement rides. The Engineering Unit has, over the last 14 years consulted with industry, Engineers Australia and has been responsible for establishing the National Work Health and Safety (WHS) Regulators Group.

[1378] Ex F17(a), pg. 11
[1379] Ex F16B(28), pg. 1
[1380] Ex F16B(28), pg. 1

OIR TECHNICAL ADVICE ABOUT THE INCIDENT

Technical Advice - Principal OIR Adviser (Mechanical), Mr. David Flatman

714. Principal Workplace Health & Safety Adviser (Mechanical), Engineering Service Unit, Mr. David Flatman provided a detailed report in relation to this incident for the purpose of providing advice to the Legal Unit of OIR.[1381] He attended site on a number of occasions, and provided an opinion as to what the contributing factors and likely causes of the incident may have been, as well as the safety issues associated with the maintenance and inspections of the ride. Only relevant technical information as to the incident and cause is detailed below.

715. Mr. Flatman, who is now the Chief Advisor for Engineering Services, Specialised Health and Safety Services with OIR, had almost 10 years' experience as a Principal Inspector at the time of the tragedy.[1382]In this role, he provided technical support to the inspectorate, legal and prosecutions units within OIR, as well as external advice to stakeholders in relation to plant safety. He held engineering roles prior to his employment with OIR.

Inspections and Testing

716. Mr. Flatman attended the scene on a number of occasions and was involved in the re-enactment testing undertaken.[1383] Relevantly, he noted the following:

- The ride appeared to be in generally poor condition, with significant corrosion evident throughout the steel components of the ride and concrete degradation in two of the tunnels.[1384]

- Testing in an attempt to reconstruct the incident demonstrated that the rails near the unload area were approximately 300 mm below the water surface during operation.[1385] It also showed that the conveyor can cause a raft to bounce when it is pushed back into the conveyor and the conveyor turned off.[1386]

- The tests also showed that the water level dropped by approximately 400 mm in 40 seconds when the south pump is turned off. The operating water level was 2.26 m, which dropped to 1.83 m when only the North pump was operating.[1387]

717. Mr. Flatman's findings as to the sequence and likely cause of the incident largely accord with that of Senior Constable Cornish. In summary, he finds that the incident was primarily due to the second raft being forcefully driven towards and colliding with the stationary leading raft while the leading raft's forward movement was obstructed on the rails.[1388] The leading raft was grounded on the rails near the unloading area as a result of the southern pump failing and causing the water level to drop below the rails. It is likely that the leading raft was obstructed by the cross brace between the rails in the vicinity of the unloading area. The second

[1381] Ex F9A(1)
[1382] Ex F19(11)
[1383] Ex F9A(1), pg. 8
[1384] Ex F9A(1), pg. 8
[1385] Ex F9A(1), pg. 11
[1386] Ex F9A(1), pg. 12
[1387] Ex C4(4), pg. 248-250
[1388] Ex F9A(1), pg. 12

raft was then driven into the stationary leading raft by positively engaging with the slats on the conveyor. This resulted in both rafts rising up at their point of contact. The motion of the conveyor caused the rear of the second raft to be drawn down into the gap between the rails and the conveyor fatally injuring four passengers.[1389]

718. In terms of the contributing factors to the incident, Mr. Flatman identified the following:

- *Stationary raft* – listed as a significant contributing factor, given the collision would not have occurred had this raft not been grounded on the rails near the unload platform.[1390]

- *Gap at the end of the conveyor* – the geometry of the gap between the head of the conveyor and the steel rails was sufficiently large enough to allow the second raft to be drawn in by the motion of the conveyor. *Measurements by Mr. Flatman indicate that the gap between the rails and the conveyor shaft were 760 mm, with the gap from the rails to the wooden slats was 390 to 460 mm.* **[1391]**

  Given the measurements of the rafts and the tube diameter, it was found that the tube could easily fit into the gap if it was pushed back. The gap at the head of the conveyor between the slats and the rails is small enough to allow the slats on the conveyor to bite onto the tube and draw it into the gap.

- *Missing slats* – measurements taken by Mr. Flatman of the gap created by the missing slats on the conveyor were 770 mm, with the width of the gap between the small wooden pads on the conveyor being 1255 mm. This created a void large enough to allow the 1650 mm diameter of the raft plug to drop down and positively engage with the slats on the conveyor.[1392]

  Mr. Flatman notes that *'when a raft was positioned on the conveyor in such a way that resulted in the slat being located under the middle of the plug, the resulting seesaw effect could cause the rear of the plug to tip downwards into the void and positively engage with the adjacent slats on the conveyor. In addition with the conveyor running the missing slats created alternating large and small gaps that could bite into a raft tube and increase the likelihood of a raft being drawn in the gap at the head of the conveyor. The missing slats is considered to be a significant contributing factor to the incident'*.[1393]

- *Bowed slats* – Some of the slats on the conveyor were observed to be bowed upwards approximately halfway along their length by approximately the thickness of the slats (50 mm). This increased the bite on the tube and may also have caused the slat to bow further outwards when loaded against the tube of a stationary raft, increasing the tendency for the tube to be drawn into the gap between the conveyor and the

[1389] Ex F9A(1), pg. 13
[1390] Ex F9A(1), pg. 13
[1391] Ex F9A(1), pg. 13
[1392] Ex F9A(1), pg. 14
[1393] Ex F9A(1), pg. 14 & 15

rails.[1394]

- *Gap between rails* – the distance measured by Mr. Flatman of the rails in the vicinity of the unload platform was 1250 mm, which is similar to that between the small wooden pads on the conveyor.[1395] The distance between the cross rails was 1270 mm. This created a void large enough for the plug in the leading raft to protrude into and positively engage with the cross brace preventing it from moving along the rails. The likelihood of this occurring is increased if the raft was misaligned towards one side on the rails, so as to prevent the plug from being supported by both the rails. This can be worsened if the rails were located towards one side of the channel rather than in the centre. Measurements taken during inspections show that the rails in the vicinity of the second cross brace were located off centre towards the northern side of the channel.[1396]

- *Low air pressure* – Mr. Flatman theorizes that the low air pressure in the tubes may have contributed to the incident by reducing the support provided by the tube and allowing the plug to protrude below the slats or rails and into the voids. It could have also contributed to the incident by allowing the tube to deform and be drawn into the gap between the conveyor and the rails.[1397]

- *Low water level* – Mr. Flatman found that the low water level was a significant contributing factor to this incident, as it caused the leading raft to become grounded on the rails.[1398]

- *Pump failure* – CCTV confirm that the incident was initiated by the south pump failure that caused the water level to drop below the rails and resulted in the leading raft being grounded on the rails. Testing confirmed that when one pump stopped, the water level dropped below the rails in approximately 40 seconds.[1399]

- *Seat belts* - Mr. Flatman notes that the seatbelts in place, which were made of Velcro, were unable to restrain the passenger when the raft was tilted upwards and shaken during the incident. Had the seatbelt been secured with a positive locking mechanism, such as a buckle, it may have prevented the person falling into the conveyor.[1400]

- *Operator procedures* – it is noted that the procedures, which require the unload Operator to contact the Main Operator before activating the emergency stop, prevented the conveyor from being stopped prior to the rafts colliding, which may have limited the severity of the incident.[1401]

- *Operator tasks* – had the main Operator not been distracted by the task of explaining and removing passengers from the load area, he may have activated the emergency stop in time to prevent the incident. In addition, Mr. Flatman notes that it is difficult for a busy Operator to identify the low

[1394] Ex F9A(1), pg. 15
[1395] Ex F9A(1), pg. 15
[1396] Ex F9A(1), pg. 14-17
[1397] Ex F9A(1), pg. 17 & 18
[1398] Ex F9A(1), pg. 19
[1399] Ex F9A(1), pg. 19
[1400] Ex F9A(1), pg. 20
[1401] Ex F9A(1), pg. 20

water level in the space of 35 seconds between rafts when they rely solely on a visual check of the water level.[1402]

- *Operator experience and training* – one of the Operator's had only been trained on the day of the incident. It is unclear whether the unload Operator had been trained in the use of the E-Stop and detection of the low water level.[1403]

- *Ride Layout* – It is likely that the layout of the loading and unloading platforms resulted in the load Operator at the loading platform facing away from the Unload Operator while he was talking to guests. Had he not been distracted by this task, and the orientation of the loading platform was such that he could clearly see the Unload Operator and conveyor, he may have activated the emergency stop in time to prevent the incident. Mr. Flatman is of the view that had there been an additional Operator or deck hand available at the time of the incident, they may have been able to attend to guests and allow the Load Operator to focus solely on the operation of the ride. This may have allowed him to identify the potential collision and activate the emergency stop in time to prevent the incident or respond to the unload Operator's attempts to gain his attention.[1404]

  Mr Flatman notes, however, that these are administrative controls, which are not the best way to prevent incidents and should only be utilised after more reliable control measures, such as engineering controls, are considered.

- *Control markings* – The controls at the unload platform, including the emergency stop control, were not labelled. This lack of marking would have made it harder for an unfamiliar Operator to locate it in the case of an emergency.[1405]

719. In Mr. Flatman's opinion, the **three most significant contributing factors to the incident** were:

   I. Stationary rafts on the rails;

   II. Missing slats on the conveyor; and

   III. Operator training

Control Measures

720. Mr. Flatman also briefly considered various control measures, which could have been implemented to avoid the incident.[1406] Specifically, he cited the following measures:[1407]

- **Conveyor modifications**: the missing slats on the conveyor could have been replaced, which would have reduced the likelihood of a raft being

[1402] Ex F9A(1), pg. 21
[1403] Ex F9A(1), pg. 23
[1404] Ex F9A(1), pg. 21 & 22
[1405] Ex F9A(1), pg. 22
[1406] Ex F9A(1), pg. 24
[1407] Ex F9A(1), pg. 24 & 25

forcefully driven into another by positively engaging with the slats, and reduce the possibility of the slats biting into the tube and drawing a raft down into the gap at the end of the conveyor.

- **Stationary raft monitoring:** Installation of a stationary raft monitoring system at the head of the conveyor similar to that at the foot of the conveyor. The stationary raft monitoring system could be integrated with the ride control system so that it could automatically stop the conveyor, pumps and close the jacks to prevent additional rafts from being dispatched in the event a raft becomes stuck near the head of the conveyor for any reason.

- **Operators:** Improve Operator training by explaining the position and operation of the emergency stop controls. Increase the period of time a new Operator spends with an experienced Operator when learning to operate a ride. Emergency drills could be conducted to ensure the competency of Operators in such a situation. Mr. Flatman notes s. 36 of the *Work Health and Safety Regulation 2011,* which requires that the other control measures, such as engineering controls, should be implemented first, with the residual risk then controlled by administrative controls.

- **Modifications to rails:** The rails could have been modified by adding an additional rail midway between the existing rails. A centre rail would reduce the depth the plug could protrude below the top surface of the rails and most likely prevent it from positively engaging with the cross brace.

Ride Modifications

721. The TRRR had undergone a number of significant modifications since its initial construction and design registration in 1987, registration number E1624. The TRRR was initially listed as a Class 2 amusement device.

722. There were no records of the modifications included in the design registration documents held by OIR.[1408] It is therefore unknown if the modifications were designed by a competent person in accordance with relevant technical standards, or if the design of the modifications were verified by a third party RPEQ. In accordance with s.244 of the *Work Health and Safety Regulation 2011,* the alterations to design registered plant must also be registered when they may affect health and safety. Whilst a number of the alterations were likely to have occurred before 2011, similar provisions were in place at the time.

723. Mr. Flatman is of the view that the removal of the slats on the conveyor was a major contributing factor to the incident.[1409] Markings on the channel floor in the vicinity of the unload area near the head of the conveyor indicate that the rails may have been altered. Details as to these modifications are unknown. It is possible that the markings may be left over from the turn table system that was previously removed from the ride. He is of the view that the removal of the conveyor slats was a significant modification to the ride, and the regulator should have been notified.

[1408] Ex F9A(1), pg. 25
[1409] Ex F9A(1), pg. 26

Previous Incidents on TRRR

724. Mr. Flatman considered the previous incidents that had occurred on the TRRR. In relation to the incident that occurred in 2001 involving Ms. Lynd, he notes that no engineering controls were implemented to prevent this incident from re-occurring, which did not involve the water level dropping.[1410] He notes that modification of the control system to detect a stationary raft between the unload area and the head of the conveyor would have been preferable. Clearly, there was little learning from previous incidents.

725. Mr. Flatman notes that despite the 4 incidents involving the TRRR taking place in the vicinity of the unload area near the head of the conveyor, upgrades were carried out to the beginning of the conveyor in 2016. He expresses the view that the greater risk was clearly at the head of the conveyor near the unload area.[1411]

Maintenance and Inspections

726. The information available to Mr. Flatman suggests that there was periodical and routine maintenance performed on the ride.[1412] This consisted of daily, weekly, monthly inspections, as well as annual shutdowns. In addition, maintenance was performed during ride breakdowns to return the ride into operation.

727. Mr. Flatman refers to *AS-3533.2 Amusement Rides and Devices, Part 2: Operation and Maintenance* which requires that rides undergo major inspections. This is a requirement in addition to the annual inspections. It is likely that the annual shut downs did cover some of the requirements for a major inspection.[1413]

728. During the inspections of the ride carried out by OIR, the following faults were identified:[1414]

- Missing slats from the conveyor;
- Excessive corrosion;
- Crumbling concrete;
- No guarding at the foot of the conveyor, rail system and pump outlets;
- No water back flow prevention;
- Water running over electrical components; and
- Unidentified controls including emergency stop controls

729. The inspections carried out by OIR showed that the maintenance performed on the TRRR was insufficient to prevent significant corrosion occurring or water running over the electrical components in the pump enclosure.[1415] The maintenance activities appeared to ensure that the ride remained in operation

[1410] Ex F9A(1), pg. 27
[1411] Ex F9A(1), pg. 27 & 28
[1412] Ex F9A(1), pg. 26
[1413] Ex F9A(1), pg. 27
[1414] Ex F9A(1), pg. 27
[1415] Ex F9A(1), pg. 26

rather than keeping it in good condition. Mr. Flatman is of the opinion that more should have been done to prevent and rectify the excessive corrosion and to ensure that the pump motors and electrical components were kept as dry as possible. He is of the opinion that due to the faults identified, the ride was unsafe to operate and a more rigorous maintenance regime should have been implemented.[1416]

730. In considering the inspection conducted by Machinery Inspection Services (Tom Polley) in September 2016, Mr. Flatman notes that '*a visual inspection carried out of visible parts only of the TRRR is not a detailed visual examination and is likely to lack sufficient detail to accurately form the opinion that the ride is mechanically and structurally safe to use for the next annual period when many structural components on the ride are submerged in water'* (pg. 24, 25).

731. Mr. Flatman is of the view that the faults identified by Mr. Polley that is the presence of corrosion and the critical bolted connections on the ride, were not contributing factors to the incident.

732. A number of the issues raised in previous risk assessment audits of the TRRR were present at the time of the incident, particularly the lack of control identification labelling, corrosion and the emergency stop procedure. Mr. Flatman notes that this clearly shows that the issues have been ongoing and have not been adequately addressed.[1417]

Conclusions

733. By way of summary, in Mr. Flatman's opinion, the most likely cause of the incident was due to the second raft being forcefully driven by the conveyor towards and colliding with the leading raft, while the leading raft's forward movement was obstructed against a cross brace on the rails.[1418] The space caused by the missing slats on the conveyor allowed the raft to enter the gap at the conveyor head and rails. The motion of the conveyor drew the rear of the second raft and three passengers into the gap. The conveyor continued to run for approximately 19 seconds during this time, with the raft shaking vigorously and the fourth passenger fell from his seat into the gap.

734. The incident was initiated by a sudden drop in water level as a result of the south pump stopping, due to a fault. In Mr. Flatman's opinion, monitoring the water level may have prevented the incident.[1419]

735. Mr. Flatman notes that despite previous incidents on the TRRR, at the time of the tragic event, there was a heavy reliance on administrative controls, rather than engineering control measures, to manage the evident risks and ensure the safety of the ride, which is unacceptable.[1420] He notes that there was little learning from previous incidents on the ride.[1421]

Technical Advice - OIR Principal Inspector, Mr. Ian Stewart

736. Mr. Stewart, Principal Inspector with OIR, was requested to attend and assist

[1416] Ex F9A(1), pg. 26 & 27
[1417] Ex F9A(1), pg. 27
[1418] Ex F9A(1), pg. 34
[1419] Ex F9A(1), pg. 35
[1420] Ex F9A(1), pg. 35 - 37
[1421] Ex F9A(1), pg. 37

with the OIR investigation into this tragic incident. He has extensive practical industry experience and as an investigator considering health and safety issues, with formal trade qualifications and experience, a certificate in Competency Engineer – Inspection of Machinery, and a graduate diploma in Occupational Health and Safety.[1422]

737. Mr. Stewart attended the scene on a number of occasions in October and November 2016, and considered various relevant documentation associated with the ride. As a result, he prepared a memorandum of his findings in relation to the causal factors of this fatal incident.[1423] The relevant findings of this report are outlined below.

Issue 1 - Reliance on Administrative Control in Emergency Situations

738. Mr. Stewart noted that the safe operation of the TRRR primarily relied upon administrative controls, which are outlined in the operating procedures developed for the ride.[1424] These controls require the Operators to have an understanding and ability to observe and respond to situations, including emergencies, as and when they arise, including:

- The controls used to operate the ride.
- Ensuring adequate water level.
- Preventing raft collisions.
- Monitor guest's behaviour to ensure they stay in the rafts when required.
- Loading and unloading guest's onto and off the rafts.
- A section of the ride traverses and is monitored solely by the operator at the Main Control Panel observing CCTV monitors, in conjunction with other tasks.
- Maintaining order and sorting guest's waiting to ride and those exiting the ride.

739. In relation to the tasks being performed by the Level 2 and 3 Operators prior to the fatal incident, which may have contributed to the delay in becoming aware of the developing emergency situation, Mr. Stewart notes that:[1425]

- Tests runs of the ride following the incident demonstrated that it was difficult to identify that the south pump had stopped solely by observing any change in noise levels. The north pump continuing to operate generates sufficient noise levels as a possible indicator to Operators that a pump had tripped.
- The Ride Operators rotate positions between the 'Load' and 'Unload' stations periodically while the TRRR is in operation.

[1422] Ex F19(1)(b)
[1423] Ex F19(1)
[1424] Ex F19(1), pg. 4
[1425] Ex F19(1), pg. 5 & 6

740. Having considered the functions required of the Level 3 Operator whilst manning the TRRR, Mr. Stewart notes that a majority would have had Mr. Nemeth facing away from the Main Control Panel and the unload area where Ms. Williams was located.[1426]

741. The applicable Australian standards (AS-3533 series & AS/NZS 4024), provide guidance as to 'Operator Information Handling Limitations'. AS/NZS 4024.1901:2014 – Safety of Machinery Part 1901, and describe situations and tasks that may impact negatively on the Operator's ability to respond effectively in emergency situations, where the number and/or complexity of concurrent tasks is excessive. At Appendix A 'Application Guide' of this Standard, the following guidance is provided:[1427]

> **A.2 Attention**
>
> In many situations, e.g. those involving a human operator in a human-machine system, the person can be viewed as a single channel processor with capacity to process information from no more than a few sources at a time.
>
> Attention is normally confined to two main sources, the internal world i.e. thoughts and sensations from the body, and the external world. Since attention can be described as a limited resource, there may be competition among attentional resources. For example, an operator who is occupied with thoughts or decision making may suffer attentional deficits regarding events happening in the outside world. A consequence of the design of human-machine systems is that it is essential not to overload the attentional resources of the operator.

742. Mr. Stewart identified a number of tasks performed administratively by the TRRR Operators to control 'high risk' situations, which he is of the view should have been controlled and/or minimised by appropriate 'engineering controls', namely:[1428]

- Monitoring and prevention of rafts colliding in the unloading area; and
- Water level monitoring.

743. Additionally, the following components of the ride were in Mr. Stewart's opinion, deficient at the time of the incident, and are likely to have limited the Operators ability to respond effectively to prevent this tragic incident from occurring:[1429]

- Ride operating controls.
- Marking of controls.
- Ride operating procedures.
- Testing of emergency procedures, including how often the testing should be done.

[1426] Ex F19(1), pg. 7
[1427] Ex F19(1), pg. 9
[1428] Ex F19(1), pg. 11
[1429] Ex F19(1), pg. 11

744. Mr. Stewart outlines details of the past incidents from 2001-2014, which had occurred on the TRRR. He questions why, given the circumstances of some of these incidents, particularly that involving Stephen Buss, as to why a risk assessment process resulting in the installation of suitable engineering controls, was not carried out.[1430] Mr. Stewart notes that the design of an amusement device should include features (higher order controls, such as engineering controls) to protect guest's, Operators and equipment when a failure occurs. In Mr. Stewart's view, these earlier incidents on the TRRR, therefore, should have alerted Dreamworld to the fact that the current administrative controls were not effective in preventing incidents involving serious risks, such as rafts colliding in the unload area.[1431] Mr. Stewart considered what a risk assessment of the TRRR could have considered, based on the applicable legislation and regulations**,** noting that any such reassessment or review should have thoroughly reassessed the methods of control of the risk with a focus on implementing appropriate higher order controls, such as engineering controls.[1432]

745. In Mr. Stewart's opinion, the previous incidents on the TRRR on 18 January 2001, 7 October 2004 and 2 November 2014 where rafts collided in the unloading area, should have caused Dreamworld to thoroughly assess the control of the risk by installing suitable engineering controls.[1433] He notes that engineering controls are preferred over administrative controls as outlined in WHS Regulation 36, and s.4 of the OIR, *How to manage work health and safety risks – Code of practice 2011.*

Issue 2: Limitations of the Ride Emergency Controls, Systems and Procedures Provided for the Operator to Respond to Emergencies

746. Mr. Stewart notes that the prevention of the fatal incident was solely reliant on the Ride Operators observing and responding to:

(a) Rafts colliding in the unloading area; and

(b) Water level drop.

747. In this regard, Mr. Stewart raises concern as to the limitations of the ride controls and procedures as are required to be used by the Operator.[1434] He notes that controls should be marked such that the Operators can easily identify the control, the equipment involved and task the control performs.[1435] This becomes particularly important in an emergency situation when Operators may panic and/or hesitate in deliberating a course of action.

748. Section 210 of the *WHS Regulation* specifically requires the marking of operational and emergency stop controls. Mr. Stewart notes that the control panel at the main load section on the TRRR does not comply with WHS Regulation as the controls are not clearly marked.[1436]

749. Section 211 of the *WHS Regulation* pertains to Emergency Stops. Mr. Stewart notes that the conveyor emergency stop located at the unload area is an

[1430] Ex F19(1), pg. 11
[1431] Ex F19(1), pg. 14
[1432] Ex F19(1), pg. 20
[1433] Ex F19(1), pg. 18
[1434] Ex F19(1), pg. 21
[1435] Ex F19(1), pg. 23
[1436] Ex F19(1), pg. 24

essential control as it is the only way for this to take place, and should have been clearly marked 'Conveyor Emergency Stop'. He opines that this may have prompted the Unload Operator to activate this stop, had she been trained accordingly.[1437]

750. In relation to the Operator Procedure in effect, Mr. Stewart notes that in his view, there was an inordinate amount of material and information to absorb in a short time, and also to become competent in. He is of the view that a longer period of supervised training would have been appropriate.[1438] However, he finds that irrespective of the sophistication in the training provided, the risks associated with rafts colliding and/or the water level drop are significant, such that administrative controls, including Operator monitoring and controlling them is not an appropriate control measure.[1439]

751. Mr. Stewart also notes that regardless of the sophistication of plant, equipment and means of controlling emergency situations, it is common practice within the Amusement Park industry to perform periodic emergency drills.[1440] No emergency drills were conducted for the TRRR. He is of the view that these drills may have assisted in preventing the incident, however, could not have been used in lieu of appropriate engineering controls to minimise the 'high risk' issues associated with the ride.[1441]

Issue 3 - Monitoring and Prevent of Rafts Colliding in the Unloading Area

752. In Mr. Stewart's view, rafts impacting each other in the unloading area, is the primary risk to the health and safety of patron's riding the TRRR, specifically referring to the previous 2001 incident.[1442] He notes that when the conveyor continues to operate after this occurs, the following raft could then be driven by the conveyor into the stationary raft where there is a risk of serious injury or death due to crushing, entrapment and/or drowning. In Mr. Stewart's opinion, these previous incidents should have caused Dreamworld to assess and control the risk prior to the fatal incident.[1443]

753. Reference is made to the previous engagement of suitable persons to install appropriate controls to minimise a similar risk at the beginning of the conveyor. Accordingly, suitable technical standards, appropriate monitoring equipment and competent persons were known to Dreamworld prior to the fatal incident.[1444]

Issue 4 – Water Level Monitoring

754. Mr. Stewart notes the layout of the TRRR, specifically the use of the water pumps, which ensure that an artificial stream is provided so that the rafts can float. Hazardous situations may be created when one or both pumps fail. In particular, when one pump fails, the water, which normally covers the raft catch rails located at the unload area, drops, which doesn't allow sufficient buoyancy for the rafts to float, and as such, they rest on the rails. Occurrences where the pumps have tripped causing a subsequent loss of water were not uncommon on

[1437] Ex F19(1), pg. 25
[1438] Ex F19(1), pg. 30
[1439] Ex F19(1), pg. 30 - 32
[1440] Ex F19(1), pg. 32
[1441] Ex F19(1), pg. 32
[1442] Ex F19(1), pg. 34 & 35
[1443] Ex F19(1), pg. 34
[1444] Ex F19(1), pg. 35

the TRRR. However, in the week prior to the incident, the pumps had tripped more frequently.

755. Mr. Stewart notes that water level monitoring equipment, which was capable of stopping the conveyor when the water level dropped, would have cost around $2000 - $3000 if it had been included in the earlier upgrade work.[1445] He further highlights that consideration had been given to having this type of monitoring implemented by Dreamworld in 2016, demonstrating that this risk had been identified earlier, and was known.

Issue 5 – Gap at the End of the Conveyor at the Unloading Area

756. The width of the gap at the unloading end of the conveyor on the TRRR is sufficient to allow a raft to be drawn into it, creating the risk of death or serious injury associated with entanglement or entrapment of persons on the raft.[1446]

757. It does not appear that any risk assessments were conducted by Dreamworld in relation to this gap, which may be somewhat hidden during the normal operation of the ride by the water.[1447]Mr. Stewart expresses the view that this hazard would not have been obvious to the casual observer, and therefore, detailed research and observation would have been required to identify and control the hazard.[1448]

758. In relation to the standards applicable to conveyors, Mr. Stewart specifically refers to AS/NZS 4024.1201:2014 Safety of Machinery Part 1201**:** *General Principles for Design – Risk Assessment and Risk Reduction*, which provides examples of hazards, hazardous situations and hazardous events. Moving elements with the potential to draw in, as was the case for the conveyor on the TRRR, is specifically cited.[1449]

759. AS/NZS 4024.3610:2015 Safety of Machinery Part 3610: Conveyors – General Requirements, at point 1.5.21, defines a 'nip point', which is:

> *The point at which a moving conveyor element meets a fixed or moving element, so that it is possible to nip, pinch, squeeze, entangle or entrap parts of the human body.*

760. Relevantly, at Point 2.13.2 – Hazardous Situations and Parts Requiring Safeguards of this guidelines, it further states that:

> *1.13.2.1 General*
> *Safeguards shall be designed to prevent –*
> ***(a) Persons reaching into the danger zone or other body parts becoming caught or entangled;***
> *(b) Conveyed materials accidentally falling or being projected into persons;*
> *(c) The hazard from the failure of a component;*
> *(d)* ***Contact with a danger point (i.e. nip or shear points) on the conveyor.***

[1445] Ex F19(1), pg. 42
[1446] Ex F19(1), pg. 44
[1447] Ex F19(1), pg. 44
[1448] Ex F19(1), pg. 44
[1449] Ex F19(1), pg. 45

1.13.2.2 Shear points and nip points
All accessible shear and nip points which create a risk to health or safety shall be safeguarded in accordance with this Standard or the AS 4.24.1 series, except for belt conveyor applications in accordance with AS/NZS 4.24.3611
NOTES
…
2. Shear and nip points are created where the gap between any moving part of the conveyor and any fixed equipment is greater than 5 mm and less than 120 mm.

1.13.2.3 Rotating parts
All exposed rotating shafts or other parts shall be guarded, unless the design risk assessment indicates there is no unacceptable risk to health or safety.
All exposed projections, gaps, shafts couplings, collars or similar shall be guarded.

761. At AS/NZS 4.24.3612:2015 Safety of Machinery Part 3612: Conveyors – Chain conveyors and unit handling conveyors, it notes that:

TABLE 2.1 – TYPICAL HAZARDS ASSOCIATED WITH CHAIN CONVEYORS AND UNIT HANDLING CONVEYORS

ENERGY SOURCE/HAZARDS	DESCRIPTION
Mechanical Hazards	
Crushing and shearing hazards	Hazards may occur where parts can move against or past one another or against fixed parts or past one another or past other fixed parts so that persons or parts of their bodies can be crushed or sheared.
Entanglement hazards	Hazards may occur where projecting sharp edges, teeth, wedges, screws, lubricating nipples, shafts, shaft ends or the like move so that persons, parts of their bodies or their clothing can be caught and carried along.
Drawing-in hazards (nip points)	Hazards may occur where parts move so that a constriction is formed in which persons, parts of their bodies or their clothing can be drawn in. Examples of drawing in points or nip points are as follows: (a) Between the traction or carrying elements or attached pushers and fixed parts of the conveyor or of the surrounding. (b) At the traction or carrying elements in the area of direction changing points. (c) Between the traction or carrying elements and supporting rollers. (d) At contact points of pushers on slide ways. (e) At transfer points of conveyors as well as at chutes, roller and gravity tables.

762. Accordingly, Mr. Stewart notes that the gap on the conveyor on the TRRR varies from 500 mm to around 1 metre at the unloading end of the conveyor.[1450] As this is greater than 120 mm, this technical standard does not consider it a hazard. However, he noted the following:[1451]

- AS/NZS 4024.3610:2015 primarily considers the movement of product

[1450] Ex F19(1), pg. 46
[1451] Ex F19(1), pg. 47

and materials and not persons.

- A risk assessment should have been conducted following the modification/s that appears to have created this gap.

763. In addition to the risk posed by the gap at the end of the conveyor and the unload area rails, the following further hazards were also observed:[1452]

- Gaps between the slats in the conveyor system were excessive, such that a person may fall and/or get out of the raft due to skylarking and panic, and could fall through the conveyor resulting in injury or death due to crushing, shearing and/or drowning.

- Lack of maintenance and excessive corrosion negatively impacting on structural integrity and impacting on patron and worker safety.

764. In terms of the risks associated with the conveyor, Mr. Stewart notes that reinstating the slats and extending the raft catch rails would have minimised the risk of a raft or person's whole body falling through the gap, however, a sufficient gap may have remained that there would still be a risk to body parts, such as arms and legs.[1453] Had an appropriate SIL 3 rated engineering control been installed to monitor and control the risks associated with raft collision and maintain correct water level, this would have removed the threat posed.[1454]

765. Mr. Stewart is of the view that there was information readily available to Dreamworld to identify the potential hazard created by the large gap at the end of the conveyor.[1455]

PROHIBITION NOTICE – ARDENT LEISURE

766. On 8 November 2016, following the tragic incident, a Prohibition Notice ('the Notice') was issued to Ardent Leisure by Principal Inspector, Mr. Ian Stewart, pursuant to s. 195 of the *Workplace Health and Safety Act 2011.*[1456] This Notice precluded the operation of the TRRR until a serious risk to health and safety emanating from an immediate exposure to a hazard associated with a person being entangled in moving conveyors or submerged obstacles was rectified. The basis for the view held by Mr. Stewart was listed as follows:

- The width of the gap between the end of the conveyor and the steel catch platform, which is sufficient to allow a raft to be drawn into it creating a risk of death or serious injury.

- Insufficient controls are in place to prevent a raft from entering the unloading station whilst another raft remains in the area between the end of the conveyor and unloading deck. This creates a serious risk of death or serious injury associated with entanglement or entrapment.

- Where a person falls from a raft there is limited access for effective emergency response.

[1452] Ex F19(1), pg. 47
[1453] Ex F19(1), pg. 49
[1454] Ex F19(1), pg. 49
[1455] Ex F19(1), pg. 49
[1456] Ex F19(1), pg. 59 & 60

767. The Notice states that in its current state, the TRRR was not able to be put back into service at any time, and poses an imminent risk to person's health and safety from exposure to the hazards cited above.

REGULATORY RESPONSE FOLLOWING THE INCIDENT

2016 Audit Campaign

768. Commencing on 29 October 2016 and concluding on 2 December 2016, a compliance and audit program of Queensland's six largest Theme Parks, including Dreamworld, was undertaken by OIR.[1457] The audit team consisted of a Director, Operations Manager, Engineers, and a number of Senior and Principal Work Health and Safety and Electrical Safety Inspectors. Assistance was also provided by other jurisdictions, with Engineers and Work Health and Safety Inspectors from WorkSafe Victoria and SafeWork South Australia.[1458]

769. OIR described this audit as '*comprehensive*', and included over 90 audits conducted using the *National Audit Tool for Amusement Devices,* which involved a desktop review of the ride followed by on-site testing and verification. [1459] Specifically, Inspectors reviewed the documentation for each ride in relation to plant and design registration, maintenance and operating manuals, instruction and training of Operators, annual inspections by competent persons, repairs and alterations, critical components and associated non-destructive testing, emergency plans, asbestos, noise and electrical hazards and risks.[1460] The site verification process involved Inspectors observing the operation of the ride, talking to the Ride Operators and other relevant persons, and assessing the actual operation of the ride against the systems outlined in the documentation provided.[1461]In addition, engineers were also engaged to review the current risk assessment documentation for each ride and provide support to Inspectors through technical assistance during the site verification.[1462]

770. The OIR Public Swimming Pool Checklist was used for those Theme Parks, which operated water based rides. Key elements, which were addressed in the audit tool, included: administration, general supervision, first aid, facility design, water features and technical operation.[1463]

771. As a consequence of the audit, 96 Individual Assessments were completed, 14 Improvement Notices and three Prohibition Notices, which related to amusement ride the Buzzsaw at Dreamworld, were issued.[1464]

772. Twenty-four audits were conducted for Dreamworld, with a focus on the 'Big 9 Thrill Rides'. Eight notices were issued in total.[1465]

773. In a *Theme Park Report 2016,* OIR outlined the findings of the audits conducted. Relevantly, the following recommendations were made:[1466]

[1457] Ex F2A(3) [64]
[1458] Ex F2A(20), pg. 1
[1459] Ex F2A(20), pg. 1
[1460] Ex F2(2), pg. 99
[1461] Ex F2(2), pg. 99
[1462] Ex F2(2), pg. 99
[1463] Ex F2A(3) [65]
[1464] Ex F2A(3) [66]
[1465] Ex F2A(20), pg. 2
[1466] Ex F2A(20), pg. 3

- OIR to review and comment as necessary on the reports prepared by external engineers Pitt & Sherry on all amusement rides at Dreamworld.

- Facilitate a forum with stakeholders in the amusement ride industry to discuss current legislative requirements, policy decisions, audit tools and relevant issues in the first half of 2017.

- Conduct proactive audits on fixed amusement rides by 30 June 2017, to ensure compliance with relevant Work Health and Safety Laws.

- Conduct annual inspections of fixed amusement rides each year following the initial six monthly audits listed above.

- Conduct proactive audits to ensure that all plant at major Theme Parks is registered as required.

2017 Audit Campaign

774. A second major compliance program was undertaken between 12 October 2017 and 17 November 2017, involving the six major Theme Parks.[1467] The process of assessment for this audit was broadened to include a review of the overall safety management system and hazard specific systems of each person conducting a business or undertaking.[1468] Existing assessment tools, such as WHS Regulators National Audit Tool for Amusement Devices, were modified for use at Theme Parks and incorporated input from five OIR specialist units. Furthermore, industry stakeholders, including AALARA and the Australian Workers Union, as well as business owners, were consulted for the purpose of the audit program and advised of the process and tools to be used.[1469]

775. As a result, 102 Individual Assessments were completed, 16 Improvement Notices and three Electrical Safety Notices were issued during the campaign.[1470] The major non-compliance issues identified were those relating to annual inspections of registered plant. Other issues that were identified include the following:[1471]

    - Falls from height;
    - Fuel dispensing in close proximity to electrical equipment;
    - Electrical installations and maintenance; and
    - The 'test and tag' procedure for specified electrical equipment on rides.

776. An additional 22 issues were identified by inspectors during the audits and were immediately rectified therefore not attracting a non-compliance notice.[1472]

777. A number of audit tools were used for the purposes of the campaign, including:[1473]

    - Theme Park Systems Assessment;

[1467] Ex F2A(3) [68]
[1468] Ex F2A(26), pg. 2
[1469] Ex F2A(26), pg. 2
[1470] Ex F2A(3) [69]
[1471] Ex F2A(3) [69]
[1472] Ex F2A(3) [70]
[1473] Ex F2A(3) [73]

- Hazard management systems assessment;
- Onsite verification;
- Waterslide inspection guidance and checklist; and
- Theme Park audit survey.

778. OIR note that they, *'will continue to support the major Theme Parks to enable improved safety outcomes for workers and the general public. Businesses are also encouraged to work together to improve safety within their industry. OIR have increased the level of enforcement activities on the Theme Park industry by verifying effectiveness of training for operation of amusement rides, including emergency procedures; and conducting random auditing of the design of new or modified amusement rides'.*[1474]

779. A *Draft Project Closure Report* was prepared by OIR detailing the findings of the 2017 audit report.[1475]

Best Practice Review of OIR

780. The Best Practice Review (BPR) was commissioned by the Queensland Government following this tragic incident and another fatality at an Eagle Farm worksite in October 2016. This tragedy raised particular concern as to the regulation of safety matters in Queensland.

781. Relevantly, the BPR and its recommendations considered:[1476]

- The appropriateness of OIR's Compliance and Enforcement Policy;
- The effectiveness of OIR's compliance regime, enforcement activities and dispute resolution processes;
- OIR's effectiveness in relation to providing compliance information and promoting work health and safety awareness and education;
- The appropriateness and effectiveness of the administration of public safety matters by OIR; and
- Any further measures that can be taken to discourage unsafe work practices, including the introduction of a new offence of gross negligence causing death as well as increasing existing penalties for work-related deaths and serious injuries.

782. The general findings of the BPR recognised that there was an ongoing need for OIR to improve the human capital, systems and processes in place, particularly in relation to the inspectorate, investigations and prosecutions.[1477] A re-balance of priorities in favour of 'hard' compliance work, as opposed to capacity building areas, with a view to increasing ground visibilities and activity of the inspectorate was recognised as necessary.[1478]

783. Overall, the BPR made 58 recommendations, with the following three relating to

[1474] Ex F2A(3) [71] & [72]
[1475] Ex F2A(26)
[1476] Ex F2(1), [4]; Ex F2(2), pg. 18
[1477] Ex F2(2), pg. 8
[1478] Ex F2(2), pg. 9

public safety, specifically requiring the introduction of regulatory amendments to improve amusement device safety:[1479]

- *Recommendation 41:* The WHS Regulation 2011 be amended to require that:
    - Mandatory major inspections of amusement devices, by competent persons, are conducted;
    - Competent persons are nominated to operate specified amusement devices, and
    - Details of statutory notices are recorded in the amusement device log book and made available to the competent person inspecting the amusement device.
- *Recommendation 42:* OIR in consultation with relevant stakeholders, determine the level of competency required for the inspection of specified types of amusement devices, and the level of competency required for the operation of specified amusement devices (including the potential need for formal licensing arrangements to apply in respect of certain categories of device), and that the WHS Regulation 2011 be amended accordingly.
- *Recommendation 43:* The WHS Regulation be amended to require, for Operators of amusement devices, a similar regulatory approach to that taken for Operators of facilities which use, generate, handle or store hazardous materials. That is, for Operators and facilities whose amusement devices collectively present a high risk, require preparation of a safety case (which includes a WHS System) and application of a licensing regime. For Operators and facilities whose amusement devices collectively present a medium risk, require preparation of a WHS management system and application for a lower level licensing regime.

784. It was noted in the BPR that for older amusement devices poor mechanical integrity and a lack of modern safety control measures were a concern.[1480] Although annual inspections are mandated under the WHS Regulation, this requirement falls short of a 'major inspection', which should include the examination of all critical components of the device, as well as a check of the effective and safe operation of the ride by a competent person with formal engineering qualifications and experience.[1481] OIR indicated that they were in discussions with the engineer's professional body (Engineers Australia) to re-activate the National Engineers Register for in-service inspection of amusement devices. A proposal is also to be made to the Board of Professional Engineers, Queensland to set up a similar register.[1482]

785. It was recognised that the level of risk to the public from amusement devices is comparable to that of facilities, which use, generate, handle or store hazardous materials.[1483] Accordingly, it was acknowledged that a similar regulatory approach may be necessary for Operators of amusement devices where the

[1479] Ex F2(2), pg. 14 & 15
[1480] Ex F2(2), pg. 100
[1481] Ex F2(2), pg. 100
[1482] Ex F2(2), pg. 100
[1483] Ex F2(2), pg. 101

collective risk for those devices exceeds certain thresholds.[1484]

786. In August 2017, the Queensland Government considered the recommendations of the BPR and supported the recommendations made regarding amusement devices.[1485] OIR has consulted with a range of peak bodies and individuals following the release of the BPR.

787. On 31 August 2017, two meetings were held with show circuit representatives and the major Theme Parks to discuss the BPR recommendations in relation to amusement devices. The Honourable Grace Grace MP, who was the Minister for Employment and Industrial Relations, Minister for Racing and Minister for Multicultural Affairs at that time, attended part of the meeting with the Theme Park representatives.[1486]

788. Following these meetings, the Amusement Device Working Group of industry stakeholders was established and met on 27 September 2017 to discuss the BPR recommendations.[1487]

789. A draft of proposed regulatory amendments was developed by the Office of the Queensland Parliamentary Counsel during early 2018. On 11 May 2018, the Amusement Device Working Group met to discuss the proposed amendments to the WHS Regulation.[1488]

790. I accept that the recommendations of the BPR have been accepted and are being put in place. Once in place, the OIR should conduct a further audit to determine all recommendations are in operation and are achieving the best results possible.

OIR Plant Inspectors (Amusement Devices) Subgroup

791. The effectiveness of the compliance campaigns on amusement devices has been improved through the implementation of regular training updates for OIR inspectors conducting the audits.[1489] In June 2017, a subset of the OIR Plant Network Group was established. The Amusement Device Inspectors function to provide specialist support to the audit programs for both fixed and mobile amusement devices. These specialists possess a high level of understanding of the plants, as well as knowledge of the ***National Audit Tool for Amusement Devices*** and the AS3533 series of standards.[1490]

792. The members of the amusement device sub-group are provided with the relevant training and experience sharing opportunities by the OIR Engineering Unit.[1491] This sub-group act as a repository of amusement device-related information, audit issues or operational procedures to be shared with other inspectors (who may at stages be auditing amusement devices).[1492]The sub-group members support the mentoring and training of inspectors for amusement device auditing, and meetings are held prior to the commencement of audits at Theme Parks or

[1484] Ex F2(2), pg. 102
[1485] Ex F2(1), [9]
[1486] Ex F2(1), [11]
[1487] Ex F2(1), [12]
[1488] Ex F2(1), [14]
[1489] Ex F2A(3) [78] & [79]
[1490] Ex F2A(3) [79]
[1491] Ex F2A(3) [80]
[1492] Ex F2A(3) [80]

regional shows.[1493]

Plant Item Registration Working Group

793. Convened in November 2016, the Plant Item Registration Working Group aimed to examine the current administrative, system and compliance activities undertaken throughout the plant registration life cycle.[1494] The working group considered the following:[1495]

- The feasibility of compliance audits for registered plant for high risk plant owners, e.g. those registrable plant items with additional specific regulatory requirements; and

- Constraints of the existing plant system and possible enhancements to ensure the plant registration life cycle is administered effectively.

794. As a result of the working group, a number of system enhancement and process improvements were made, namely:[1496]

- Improvements to invoicing and journaling functions to reduce manual intervention required for reconciliations;

- Inclusion of audit trail and notes functionality to better maintain information on customer transactions; and

- Changes to field functionality to make the system data easier to interpret for internal staff.

795. Although the administrative registration scheme for plant does not replace or relieve a duty holder of the regulatory requirements regarding plant use, maintenance and inspection data gathered through the registration process can be used to assist compliance of high risk plant, including amusement devices.[1497]

796. OIR has initiated a two phase audit program for plant item registration:[1498]

- *Phase 1:* physical inspection of items of plant that are not re-registered in the new registration period, to ensure that unregistered plant are not in operation. These audits are carried out by the regional inspectorate supported by the engineering unit. Statutory notices are to be issued if an unregistered plant is found to be in operation.

- *Phase 2:* desktop audit of registered plant items to confirm the required design registration, maintenance and inspection records are available and are compliant with the Regulation.

797. Upon implementation, 70 plant item registrations per year will be randomly selected for desktop audit, until the introduction of the new Regulation is in force and a safe case system implemented.[1499]

[1493] Ex F2A(3) [81]
[1494] Ex F2A(3) [82]
[1495] Ex F2A(3) [82]
[1496] Ex F9C(2)(a), [98]
[1497] Ex F2A(3) [83]
[1498] Ex F9C(2)(a), [100] – [102]
[1499] Ex F9C(2)(a), [103]

Amusement Devices Stakeholders and Regulators Forum

798. OIR held an amusement devices stakeholders' forum in Brisbane during February 2017. Subsequently, in May 2017, OIR chaired the Amusement Devices Stakeholders and Regulators Forum, as a part of the annual conference organised by AALARA.[1500]

PROPOSED REGULATORY AMENDMENTS

799. Following the tragic incident, a number of changes were made to the WHS Act and the Regulations.

800. In December 2016, ss. 2, 272A and 279A of the Regulations were amended to retain the existing annual plant item registration and renewal arrangements until 1 January 2019. This amendment was made through the Work Health and Safety and Other Legislation Amendment Regulation (No.1) 2016 (SL No. 229 of 2016), which was made by Governor in Council on 7 December 2016, and notified on the Queensland legislation website on 9 December 2016.[1501]

801. At the time of the amendments, the removal of plant registration was being considered as part of the Council of Australian Governments (COAG) review of model WHS laws. Maintaining the annual registration for two further years (through the amendment to the Regulation) was intended to minimise the disruption for businesses until the Government considered the recommendations arising from the COAG review.[1502]The effect of this amendment was that owners of registrable plant, including certain amusement devices, were required to continue renewing registration annually.

Draft Further Amendments to the Regulations

802. Following the BPR, further proposed amendments to the Regulations were drafted to reflect the recommendations made, namely:

- The introduction of major inspections of amusement devices;
- That competent persons be nominated to operate specified amusement devices and details of statutory notices are recorded in amusement device logbooks; and
- A requirement for Theme Parks to prepare a safety case and the application of a licensing regime.

803. The first consultation draft of the new Regulatory provisions were circulated to stakeholders on the Amusement Device Working Group on 2 August 2018. Following on from feedback provided by the Group, a further amended draft was prepared in November 2018.

804. By way of an overview as to the proposed changes to the regulatory environment should the Regulation amendments be enacted, the amusement devices at Major Amusement Parks,[1503] as defined in the Regulation, would still need to be

[1500] Ex F2A(3) [84]
[1501] Ex F2A(3) [54]
[1502] Ex F2A(3) [55]
[1503] Ex F19(13), Chapter 9A, s.608A

registered/renewed until such time as a license is granted to the Park. On granting the license, it is proposed that the amusement device would be covered by a safety case prepared by the Park, and therefore the device would not need to be registered separately. The systems for inspection, maintenance and testing of amusement devices at Major Amusement Parks would be audited by the Regulator as part of monitoring compliance with the proposed Major Amusement Park license and safety case system. Registration for amusement devices at workplaces other than licensed Major Amusement Parks would remain the same.

Major Amusement Parks and the Proposed Safety Case Licensing System

805. Through the introduction of Part 9A.3 of the draft amendments to the Regulations, it was proposed that a **safety case and license regime** be established for Major Amusement Parks, requiring a comprehensive and integrated approach for managing safety at the Parks.

806. The Major Amusement Parks[1504] which would fall within this regime are:

- Aussie World;
- Dreamworld and WhiteWater World;
- Sea World;
- Warner Bros. Movie World; and
- Wet 'n' Wild.

807. From a declared date, a Major Amusement Park will have:

- Six months to provide the Regulator with a safety case outline.[1505] This outline is required to include a written plan for preparing a safety case about the amusement devices at the Park, including key steps and timelines, methods and resources to be used, details as consultation with workers, draft emergency plan and how the case will address annual and major inspections, maintenance and testing of devices, instruction and training to Operators, log books and how the effectiveness of the safety case will be monitored.[1506]

- Two years to provide the Regulator with a safety case and apply for a Major Amusement Park license. A Park can continue to operate amusement devices during this period. The license will be for the operation of the amusement devices at the Park.[1507]

808. As part of the proposed safety case regime, Major Amusement Parks will be required to prepare a written presentation addressing the following:[1508]

- Identify potential hazards and incidents involving amusement devices at the Park;

- Carry out a safety assessment for amusement devices at the Park;

- Implement control measures designed to eliminate or minimise the risk

[1504] Ex F19(13), s.608A
[1505] Ex F19(13), Chapter 9A, Division 2
[1506] Ex F9C(1)(d), pg. 6; Ex F19(13) – s.608G
[1507] Ex F19(13), s.608Q
[1508] Ex F19(13), s.608H-P, 608R

of an incident occurring;

- Prepare an emergency plan and implement it if an incident involving an amusement device occurs;

- Implement a safety management system for amusement devices at the Park; and

- Consult with workers, for example, in relation to the emergency plan, safety management system and preparing and reviewing the safety case.

809. A safety management system is a comprehensive and integrated system for managing all aspects of risk control in relation to potential amusement device incidents at the Park. It is intended to be the primary way in which it is ensured that incidents do not expose the people to serious risk to their health or safety.[1509]

810. It is proposed that once licensed, a Major Amusement Park will not be required to register its amusement devices as the Regulator will be aware of relevant information about the devices through the safety case. A license will be granted for a period of up to five years, and conditions can be imposed by the Regulator on the license.[1510]

811. Sections 608N, 608O and Schedule 18C of the proposed amendments specify matters which are required to be covered in the emergency plan and safety management system for amusement devices.

812. Major Amusement Parks will still be required to comply with specific regulatory requirements regarding amusement devices, for example, in relation to annual inspections, major inspections, Operator competency and log books.[1511]

Mandatory Major Inspections of Amusement Devices

813. Through the introduction of s.241A and associated provisions, major inspections of amusement devices would be required to be conducted by, or under the supervision of, a competent person, who has the necessary skills.[1512] A competent person for amusement devices aside from inflatable devices, would be a registered engineer.

814. Such inspections, which are in addition to the existing legislative inspection and testing requirements already in place, are intended to ensure that a comprehensive check and test of the amusement device is carried out through an examination of the critical components of the device, as well as checking the safe operation of the device.

815. Major inspections would be required to be carried out every 10 years unless otherwise specified by the manufacturer of the device or a competent person, who previously inspected the device.[1513] The responsibility of ensuring such an inspection was carried out would rest with the person who had management or control of the device. By way of a transition, the next major inspection for a

[1509] Ex F9C(1)(d), pg. 7
[1510] Ex F19(13), s.608ZL
[1511] Ex F19(13), s.227
[1512] Ex F19(13)
[1513] Ex F19(13), s.241A(2)(c)

current amusement device would depend on the age of the device and whether it has already undergone a major inspection. For amusement devices that are over 10 years old and have not previously undergone a major inspection, the next major inspection must be carried out within 2 years of the new Regulation coming into effect.[1514]

816. Requirements to maintain log books (ss.242, 242A) are also to be introduced, which specify the details to be recorded.

Operators of Amusement Devices

817. Under the proposed amendments, persons with management or control of an amusement device would be required to ensure that the device is only operated by a competent person.[1515] A 'competent person' is defined as a person who has acquired through training, qualification and experience the skills to carry out the task. The effect of this provision is that an Operator, after being provided with proper instruction and training in operating the device, would also have to be assessed and determined as competent to operate the device. A record of the worker having completed the necessary instruction is required to be included in the log book for the device.

818. The intent of these provisions is to recognise that different amusement devices require varying levels of knowledge and skill to operate the ride.[1516]

Amusement Device Log Books

819. Pursuant to ss.242 and 242A of the proposed amendments, additional information would need to be recorded in the log book for an amusement device, including:

- The competency of the Operator of the device;
- The person who stores, installs, assembles, constructs, commissions, decommissions or dismantles the device being a competent person;
- Details about major inspections, including the name of the competent person who carried out the inspection, the date of the inspection, results of the inspection and recommendations of the competent person, and any components repaired or replaced during, or as a result of, the inspection;
- Details about major inspections, including the name of the competent person who carried out the inspection, results of the inspection and recommendations made, and any components repaired or replaced during or as a result of the inspection; and
- Relevant enforcement notices given for the device.

820. The log book is required to be available for inspection by a competent person carrying out a major inspection of the amusement device or an entity that has control or management of an event where the device is being operated.

[1514] Ex F19(13), ss.789 & 790
[1515] Ex F19(13), s.238 & Schedule 19
[1516] Ex F9C(1)(d), pg. 1

Purpose of the New Proposed Safety Case Regime

821. OIR maintain that the proposed safety case and licensing regime for Major Amusement Parks will involve an ongoing relationship between the Regulator and the Theme Park industry. It will require Major Amusement Parks to regularly review and update their safety case to ensure that safety is being systematically managed at the workplace. As safety cases are reviewed, updated and resubmitted to the Regulator for renewal of license application, OIR will have an ongoing role in working with the Major Amusement Parks, auditing compliance and performing the Regulator's function.[1517]

822. During the inquest, Mr. Bradley Bick, Executive Director of WHS Engagement and Policy Services, OIR stated that the safety case regime was intended to ensure that there has been a systematic and comprehensive risk assessment undertaken on each of the rides at the Theme Park by the Operator, and that there is an overlaying safety management system in place, which verifies that the necessary controls are present and effective.[1518] With respect to major inspections, Mr. Bick stated that *'there would be ongoing checks to make sure that operators were actually complying with that new regulatory requirement'.*[1519]

823. Practically, whilst the implementation of the process for auditing, assessing and administrating the safety cases for Major Amusement Parks is still being determined by OIR, Mr. Bick stated that it is anticipated that upon a safety case being submitted, Mr. Chan and the Engineering Unit at OIR would be responsible for conducting the requisite assessment.[1520] Three additional positions within the Engineering Unit, which will possess engineering qualifications and be trained to undertake the requisite assessments under the new Regulations, are to be funded to facilitate this process.[1521] It is not envisaged that third party assessments of the safety cases will be undertaken at this stage.[1522]

824. At inquest, Mr. Chan acknowledged that the new safety case regime would involve the active auditing by the Engineering Unit within OIR of Theme Parks to ensure the proposed management maintenance programs and other areas detailed in the safety case were actually effective following implementation and had been suitably verified by a qualified external specialist as required.[1523]

825. In addition to the amended Regulations, OIR are also developing a Code of Practice for the industry in consultation with relevant stakeholders, including the Amusement Device Working Group, which will set a minimum standard for the operation of amusement devices.[1524]

826. On 21 March 2019, the aforementioned amendments to the Regulations as stipulated in the *Work Health and Safety (Amendment Devices – Public Safety)* were approved by the Governor in Council and commenced on 1 May 2019.

[1517] Ex F2(1), [17]-[19]
[1518] T30-10, lines 26-45
[1519] T30-5, lines 12-20
[1520] T30-9, lines 3-13; 30-11, lines 5-15
[1521] T30-15, lines 30-45
[1522] T30-11, lines 12-40
[1523] T27-16, lines 15-45
[1524] T30-12, lines 35-48; 30-13, lines 1-15

INDUSTRY RESPONSE & INFORMATION

827. For the purpose of the coronial inquiry, various pertinent industry groups were invited to provide comment as to the incident and issues associated with the Regulation of Amusement devices in Australia and worldwide. Whilst most refused to provide any formal comment, below is a summary of the responses received.

Submission by the Safety Institute of Australia

828. On 1 August 2018, Mr. Patrick Murphy, the Chair of the Safety Institute of Australia (SIA) provided a submission as to issues associated with the management, maintenance, safety risk assessment and training associated with fixed amusement rides, such as those found at Dreamworld, as well as the Regulatory environment.[1525]

829. The key issues identified by the SIA in relation to the aforementioned matters were as follows:[1526]

(a) Issues pertaining to the adequacies of annual and longer term inspections and audits, and engineers signing off on the safety design of amusement rides, particularly in relation to the competencies of those professionals having to certify the safety of the ride. Safety covers all structural, mechanical and electrical/electronic aspects of the ride, and impacts on the effective life of the ride.

(b) Issues pertaining to the management of modifications to the manufacturer's specifications, during or following installation to ensure compliance with local Standards or legislation. Such modifications have to be approved by a competent person consistent with the requirements in item (a).

(c) The role of Australian standards in a situation where rides are generally developed and manufactured overseas to overseas standards, in particular Europe and the USA.

(d) Issues pertaining to the adequacy of maintenance of the structural, mechanical and electrical/electronic aspects of the ride in terms of compliance with manufacturers' and construction design specifications. Routine maintenance and environment has an impact on the effective life of the ride.

(e) Issues pertaining to the training and competency assessment of ride supervisors, operators and maintainers. This will include the adequacy of standard operating procedures relating to opening or closing a ride, normal operation and emergencies.

830. Generally, the SIA raised some concern as to the definition of a 'competent person' within the meaning of the Regulations and Australian Standards, as well as insufficient quality control on the application of the relevant definitions.[1527] It was noted that there was no formal mechanism to assess the competence of

[1525] Ex G3(1), pg. 1
[1526] Ex G3(1), pg. 3 & 4
[1527] Ex G3(1), pg. 4

those engineers who elect to practice in Amusement Rides and Device-in-Service. Accordingly, an RPEQ could be deemed a competent person and sign off on the issues.[1528] Whilst s.241 (5)(b) defines a competent person, SIA noted that without a 'clear understanding' of how the Regulator decides on who is a competent person, the potential for confusion exists and could result in the inappropriate sign-offs on the operation and safety of amusement rides.[1529]

831. SIA also cited the current lack of competent professional engineers with experience in amusement rides, as well as a lack of process to try and ensure these numbers grow so as to ensure the necessary expertise is sustained.[1530] It was noted, however, that IEAust was convening a panel to examine the required competency standards for the amusement ride category.

832. SIA submitted that the Regulator should undertake spot checks of the annual inspections, particularly of high risk rides, to check the appropriateness and consistency of the sign-off, and whether the inspecting engineer/auditor(s) has an appropriate holistic plant design and operating verification process.[1531] It was also submitted that the Regulator require the inclusion of maintenance plans as part of the registration of amusement rides, particularly for high risk rides.

833. With respect to the Australian Standards, SIA was of the view that Standards Australia and the Regulators should consult to harmonise their requirements for design verification a large number of amusement rides in use in Australia are internationally manufactured.[1532]

834. With respect to the maintenance of rides, SIA noted that those older than 10 years will generally not have been designed to the current safety standards. In these circumstances, it is submitted that a competent person should be required to ensure that the risk management record for the ride identifies each of the risks, implemented controls and the residual risk to ensure that safety is maintained, so far as is reasonably practicable.[1533]

835. In relation to training of Ride Operators, SIA is of the view that in order for staff to maintain competency in operating a ride, they should be tested in emergency and evacuation procedures every six months, and Operators of high-risk rides should be routinely tested through simulations of emergencies.[1534]

836. The critical recommendations made by SIA are as follows:[1535]

    I. The definition of a competent person in relation to amusement rides needs to be clarified to reflect the unique characteristics of amusement rides and their multi-disciplinary scope. This should be a joint activity between IEAust and the Regulators.

    II. IEAust needs to consider planning for succession to the current small group of RPEs competent to assess amusement rides to ensure continuity and safety of rides.

[1528] Ex G3(1), pg. 4
[1529] Ex G3(1), pg. 5
[1530] Ex G3(1), pg. 5
[1531] Ex G3(1), pg. 5
[1532] Ex G3(1), pg. 6
[1533] Ex G3(1), pg. 7
[1534] Ex G3(1), pg. 7 & 8
[1535] Ex G3(1), pg. 8

III. The Regulators should audit the quality of sign-offs of ride designs, modifications and maintenance plans, and the adequacy of training and assessment of amusement ride supervisors, Operators and maintainers. This particularly applies for older rides.

IV. For staff to maintain competency, they should be tested in emergency and evacuation procedures every six months, and Operators of high risk rides should be routinely tested through simulations of emergencies when the public is not on the ride.

V. The relevance of design aspects of A3533.1 is questioned, given that rides used in Theme Parks are manufactured in the EU or USA to standards pertaining in those countries. AS3533.2 and AS3533.3 still have an essential role.

OIR Response to SIA Submission

837. OIR were asked to consider the submission made by SIA and respond to the recommendations made and issues raised.

838. A response was subsequently provided by Mr. Bradley Bick, the Executive Director, WHS Policy and Engagement Services in the OIR.

839. OIR's response to the key issues identified by the SIA are as follows:[1536]

a) The lack of a formal mechanism to assess the competence of those engineers who elect to practice as 'competent persons' to approve the design of an amusement ride, conduct compliance checks, risk assess or perform and develop maintenance procedures and programs.

I. The OIR does not have a role in assessing or regulating the competence of engineers in their capacity as professional engineers registered under the PE Act. This is administered by the Board of Professional Engineers of Queensland (BPEQ). There is a formal assessment regime used to assess engineers' competencies against minimum requirements for engineers to gain registration as professional engineers in Queensland.[1537]

b) How does the Regulator determine who is a 'competent person', pursuant to s.241 (5)(b) of the Regulation.

I. Pursuant to the Regulation (s.241 (5)(b)(ii) & (i)) for amusement devices that must be inspected by an RPEQ, the person must also have acquired through training, qualification or experience the knowledge and skills to inspect the device. The Regulator does not have a legislated role to determine who meets the criteria under this section, as the knowledge and skill required will depend heavily on the particular type of device being inspected and its critical components.[1538]

[1536] Ex F9C(1)(b), pg. 1
[1537] Ex F9C(1)(b), pg. 1
[1538] Ex F9C(1)(b), pg. 1

c) *The need for a holistic approach to be taken in certifying a ride as safe pursuant to the WHS Act 2011, which may necessitate the involvement of multiple person/s to ensure that all technical competencies associated with components of a ride are considered.*

I. More than one competent person may be required to inspect the device, for example, a mechanical engineer and an electrical engineer may be required. The OIR understands it is routine for inspecting engineers to call upon people with specialist skills to assist when conducting annual inspections on amusement devices under s.241. The inspecting engineer maintains overall responsibility for the inspection of the amusement device including the work carried out by the assisting specialists.[1539]

II. During the inquest, Mr. Chan agreed that there needed to be a holistic signing off with respect to amusement devices.[1540] He acknowledged that as a mechanical engineer, he would not have the requisite training to consider all of the components of a ride, and may need to engage other external experts, such as non-destructive testing specialists or control systems, to consider certain elements and mechanisms.[1541]It would be likely that such specialists would need to be engaged externally.

d) *The suggestion that the Regulator should undertake spot checks of the annual inspections, particularly of the high risk rides, to check the appropriateness and consistency of the sign-off, and whether the inspecting Engineer/auditors has an appropriate holistic plant design and operating verification process.*

I. Audits of the major Theme Parks were undertaken by OIR in 2016, 2017 and 2018. These audits included checks that the annual inspection had been carried out by a competent person as required under s.241 of the WHS Regulation. The audits were conducted in accordance with the National Audit Tool for Amusement Devices by a multi-disciplinary team from OIR.[1542]

II. As part of implementing the recommendations about amusement devices made by the *Best Practice Review of Workplace Health and Safety Queensland,* a consultation draft of the proposed regulation was prepared. Annual inspections of amusement devices are an element of the safety case system proposed and Major Amusement Parks would be audited annually by the Regulator to check compliance.[1543] Mr. Chan acknowledged during the inquest, that this tragic incident had highlighted the need for the Regulator to do more to ensure compliance, with the development of Regulations requiring such action to be taken.[1544]

III. For amusement devices generally, the Regulator is also proposing that as part of the 2019 plant item registration renewal process, amusement device owners will be required to provide the name and

[1539] Ex F9C(1)(b), pg. 2
[1540] T27-12, lines 29-40
[1541] T27-12, lines 5-30
[1542] Ex F9C(1)(b), pg. 2
[1543] Ex F9C(1)(b), pg. 2
[1544] T27-14, lines 1-15

details of the competent person who has undertaken the annual inspection of the device and the date of inspection. This information will enable the Regulator to confirm the person is registered as a professional engineer in Queensland.[1545]

IV. In addition, OIR has commenced recruitment for an additional 33 workplace health and safety inspectors, with three being placed as amusement device inspectors with engineering qualifications to assist in the regulation of the Theme Parks and amusement devices.[1546]

e) The suggestion that the Regulator require the inclusion of maintenance plans as part of the registration of amusement rides, particularly for high risk rides.

I. The proposed safety case and license regime for Major Amusement Parks will require detailed information on how amusement devices will be maintained, inspected and tested. This information would need to be provided to the Regulator in the license application. Matters such as the maintenance of amusement devices would be audited annually by the regulator. Accordingly, OIR is of the view that the proposed approach addresses the outcome of SIA's suggestion.[1547]

f) Each of the critical recommendations as listed in [826]:

I. OIR will continue to consult with Engineers Australia and the BPEQ about the development of regulatory proposals in relation to amusement devices. The OIR acknowledges that the different definitions used for the term 'competent person' under the WHS Regulation are not always easily distinguished by persons not familiar with the legislation.[1548]

II. The OIR acknowledges concern in the industry as to the availability of registered engineers to inspect amusement devices. Consultation will continue with industry stakeholders, Engineers Australia and BPEQ about this matter, and broader factors influencing the decisions of engineers to work in the amusement device field.[1549]

III. Every application for design registration is checked by the OIR to ensure that the relevant technical standards have been applied for the particular type of plant and that the design has been verified by a competent person. Independent audits are conducted by the Regulator on the design of high-risk amusement devices to verify the quality of the sign-offs on new and modified designs by external professional engineers. Necessary action will be taken if there is evidence that the engineer who conducted the design verification is not fully competent. This process of checking and auditing applies to modification of an existing design for the purpose of re-registration.[1550]

[1545] Ex F9C(1)(b), pg. 2
[1546] Ex F9C(1)(b), pg. 3
[1547] Ex F9C(1)(b), pg. 3
[1548] Ex F9C(1)(b), pg. 3
[1549] Ex F9C(1)(b), pg. 3
[1550] Ex F9C(1)(b), pg. 4

IV. OIR supports a rigorous approach to ensure that amusement device operators are competent and maintain their competencies with regular opportunities to practice emergency and evacuation procedures. The draft Regulation changes will insert a provision to require that the person with management or control of an amusement device is to ensure that the device is only operated by a person who is a 'competent person'. An amendment will also be made to mandate the instruction and training requirements for amusement device Operators, which will be outlined in the safety case to be provided by the Major Amusement Parks.[1551] Risk control measures will also be required to be implemented by Major Amusement Parks to minimise the magnitude and severity of an incident to people at the Park.[1552]

V. The OIR has been actively participating in international efforts to 'harmonise' the requirements of relevant design standards on amusement devices from Europe, America and Australia. Harmonisation will ensure that critical safety requirements are similar across the standards.[1553]

VILLAGE ROAD SHOW SAFETY SYSTEMS

840. During the course of the coronial investigation, information was sought as to Safety Management System in place at the various Village Road Show Theme Parks throughout Australia.[1554]Details as to the training and ride operation of the Wild West Falls Adventure Ride at Warner Brothers Movie World on the Gold Coast was also sought.[1555]

841. Executive Safety Manager, Mr. John Donaldson, who has held this position with Village Road Show for the past 17 years, subsequently provided a number of statements detailing the various safety systems and practices in place at Village Road Show.

842. For the maintenance, inspection and testing of amusement devices at Sea World, Movie World and Wet 'n' Wild, the following processes are in place:

- Requirements of the manufacturer are reviewed and added to the maintenance schedule program (Maximo). This program, which has been in use for the past 20 years, contains a database of all maintenance checklists, inspection reports and any documentation received by any inspections undertaken throughout the year.[1556]

- Any advice received back from a manufacturer in relation to a ride or process is recorded and actioned through the record of change of management/maintenance process.

- Annually, an audit schedule is tabled with the Corporate Governance Committee, which states that an independent ride engineering audit

[1551] Ex F9C(1)(b), pg. 5
[1552] Ex F9C(1)(b), pg. 5
[1553] Ex F9C(1)(b), pg. 5 & 6
[1554] Ex F2A(4)(2)(e)
[1555] Ex C4(18)
[1556] Ex F2A(4)(2)(e), [6]

commences in October.[1557] Upon completion of an amusement ride audit, Village Road Show is issued with a certificate from an external engineer to verify a record of the annual inspection, which is utilised for renewal of plant registration. The competent persons engaged by Village Road Show to carry out inspections on the amusement devices are DRA Safety Specialists, Tom Polley and Tim Gibney, all of whom are qualified RPEQ engineers.[1558] A yearly rotating schedule is used for the engineers utilised.

- Figtree is a risk management database also utilised by Village Road Show, which records all of the hazards, risks and actions identified for the Theme Parks.[1559] Actions are assigned to managers to rectify issues, which are escalated if not completed.

843. Since 2011, Village Roadshow have been utilising external engineers to review their rides and provide independent advice and reports.[1560] Mr. Donaldson notes that some of the Engineers have been engaged by Village Road Show for around 20 years to undertake AS3533 audits.[1561] These external audits are in addition to internal audits, which are conducted by safety advisors within Village Road Show who are required to undertake checks throughout the year on the various attractions.[1562]

844. At inquest, Mr. Donaldson elaborated on the training regime and maintenance scheduling program in place at the various Village Roadshow Theme Parks. For the past 20 years, a system has been in place to house the records in relation to each of the rides, maintenance checklists, inspection reports, and including all regular inspections undertaken on the ride (such as daily, weekly, monthly and yearly).[1563] Updates and safety bulletins issued by the manufacturer of rides or Regulator are housed in this database as well.

845. Information was also provided as to the attractions training procedures ('the Procedures') in place at Movie World for the Wild West Falls Adventure Ride.[1564] Relevantly, the Procedures state the following:[1565]

- A structured and methodical approach to Operational training is contained within the Attractions Training Framework.

- The Operational department maintain a close relationship with the Technical Services Department regarding attraction matters and ensure that Manufacturer bulletins and/or procedure manual updates are implemented and adhered to.

- All Attractions are rated annually by the Park Supervisors and Trainers for the purpose of ranking the most appropriate progression of team members. Team members are assigned an Easy or Moderate Attraction at the start of their employment based on their comprehension and

[1557] Ex F2A(4)(2)(e), [7]
[1558] Ex F2A(4)(2)(e), [8]
[1559] T28-96, lines 23-40
[1560] Ex F2A(4)(2)(e), [9]
[1561] Ex F2A(4)(2)(e), [10]
[1562] T28-96, lines 1-10
[1563] T28-94, lines 5-25
[1564] Ex C4(19); Ex F2A(4)(2)(e)
[1565] Ex C4(19), pg. 1

aptitude shown at Attractions Essential training, and depending on Attraction availability with Scheduled Closures. Once trained on one or two Attractions, team members will not progress to their next Attraction until assessed as ready by their Supervisory and Trainer team.[1566]

- Individual Attraction training is provided, which includes an overview of the ride by way of a PowerPoint presentation, a specific training plan for the ride to be followed by the trainer, as well as a procedure manual issued to the trainee for the specific Attraction being learnt. It is noted that these manuals are reviewed and updated annually as a minimum, more frequently as procedural and/or manufacturer changes occur. Every training day is to follow a similar pattern, which includes all elements of the Procedure Manual, practical time at each position and an evacuation walk through for each position.[1567] If simple changes are to be made, these are communicated in the form of Toolbox Talks delivered by the Ride Supervisor in the morning and signed by all operating team members on the day.[1568]

- At the end of each Training Day, a team member must have demonstrated their competency in each required line of the Competency Checklist and completed a Written Test achieving more than 80%.[1569]

- Each Attraction has a dedicated daily Supervisor who oversees the Attraction and provides feedback and support to each Attraction Attendant. This feedback and coaching is detailed on the daily Attraction Transfer Sheet, which is recorded in each individual team members Discipline Dossier.[1570]

- All team members must also undergo an individual Attraction Training written test every six months and score more than 80%.

- Team members conduct weekly Attraction evacuation drills, scheduled for a particular day at each Attraction and is logged on an Evacuation Record sheet.[1571]

- Team members are subject to random Assessment at Attractions using the iAuditor app.

- A mentor program was in place called HERO (Helping, Encouraging and Respecting Others), which identifies key team members who are role models to other employees. HERO team members are rostered on to buddy training on training days.[1572]

- Operations Trainers were progressing through key modules of a Cert IV in Training and Assessment.[1573]

[1566] Ex C4(19), pg. 4
[1567] Ex C4(19), pg. 6
[1568] Ex C4(19), pg. 8
[1569] Ex C4(19), pg. 7
[1570] Ex C4(19), pg. 7
[1571] Ex C4(19), pg. 7
[1572] Ex C4(19), pg. 8
[1573] Ex C4(19), pg. 8

EXPERT EVIDENCE

Engineering Expert Advice

846. During the course of the coronial investigation, expert engineering advice was sought in relation to the incident and various aspects associated with the TRRR. Separate advices were provided by the following experts:

I. Dr Frank Grigg, Forensic Engineering Consultant;
II. George Rutherford, Technical Director of Projects etc. Pty Ltd; and
III. Dr Duncan Gilmore, Gilmore Engineers.

847. At inquest, evidence from the engineering experts was heard by way of a conclave.

848. A summary of the individual expert reports received, as well as the joint expert advice and evidence provided during the inquest, are outlined below.

Report on the Design of the Conveyor System by Dr Frank W. Grigg, Forensic Engineering Consulting Pty Ltd

849. On 3 November 2016, as part of the OIR investigation into this incident, Dr Frank Grigg was requested to consider the construction of the conveyor and provide expert comment on a number of matters including, whether it was suitable for its application as of 2016, the modifications made and the shutdown process that was in place when the water level dropped.[1574] In addition to considering various internal Dreamworld documentation as well as CCTV of the incident, he also attended the scene on two occasions with OIR investigators.[1575]

850. In order to assess the suitability of the conveyor design, Dr Grigg noted that it was necessary to determine, as best as possible, the interaction of the conveyor with the rafts during the incident.[1576] CCTV footage of the event was utilised, along with survey data and measurements taken by Bennett and Bennett, in order to estimate the raft positions and likely interactions during critical events.[1577] It was noted that:

- Immediately after the first contact of the rafts, as Raft 6 was pushed forward by Raft 5, it would be expected, based on the properties of the inflated tubes as well as the observations during subsequent OIR testing, that there would be some compression of the tubes as a result of the forces between them.[1578]

- Given the continued movement of the conveyor, the contact geometry and the compression of the tubes during contact at this stage of the incident (first contact), it would be expected that:

    - The lower quadrant of the front of Raft 5's tube would have pushed against the upper quadrant of the rear of Raft 6's tube -

[1574] Ex B4(1), pg. 4
[1575] Ex B4(1), pg. 1
[1576] Ex B4(1), pg. 11
[1577] Ex B4(1), pg. 11
[1578] Ex B4(1), pg. 13

locally compressing and distorting the tube segment contact.[1579]

- The front of Raft 5 plug would have tended to pitch upwards because the compression of its tube at the front would have acted as a 'jack' against the surfaces beneath it and because the geometry of the tube contact would have tended to cause the front of the raft to 'ride up' on the rear of the leading raft. Notably, a lot of the rafts weight at the time would have been borne by the conveyor. As such, the dominant direction of force transferred from Raft 5 to Raft 6 would have been in the horizontal direction.[1580]

- The rear of Raft 6 would have tended to pitch upwards because of the compression of its tube at the rear by Raft 5, which would have acted as a 'jack' against the support frames surfaces.[1581]

851. Dr Grigg noted that '*the amount of upward pitch experienced by each raft plug at the contact end would depend significantly on the inflation pressures of the deformed tube segments and the magnitude of the contact forces between them'.*[1582] Given Raft 5's tendency to pitch upwards, it would be expected that the rear edge of Raft 5 would pitch downwards, and as such, become '*more exposed to contact with the front edges of the full width slats on the conveyor*'.[1583]This would have been similar for Raft 6, which would have caused it to pitch downwards and be more exposed to contact with the edges of the support frame.[1584]

852. Dr Grigg further noted from the CCTV footage, that at 2:05:04 pm, Raft 6 can be seen to be providing sufficient resistance to the forward motion of Raft 5 to cause it to slip on the moving conveyor slats.[1585]The conveyor then 'engaged' with the raft substantively, during which time it was thought that a full width slat was likely positioned immediately behind the rear of Raft 5.[1586]

853. Dr Grigg found that the following characteristics of the conveyor and the support frame, contributed to the incident:[1587]

- The distance between the full width slats was excessive, which led to –

  - Increased probability of the plug pitching down aft and engaging more substantively with the slats and being driven forward forcefully. An increase in the number of full width slats would have reduced the probability of this occurring and may have made it more likely that the raft would have slipped on the top of the conveyor.[1588]

  - Provided a significant gap between the conveyor head end and the support frame, which increased the probability of the raft

[1579] Ex B4(1), pg. 13
[1580] Ex B4(1), pg. 14
[1581] Ex B4(1), pg. 14
[1582] Ex B4(1), pg. 14
[1583] Ex B4(1), pg. 14
[1584] Ex B4(1), pg. 14
[1585] Ex B4(1), pg. 14
[1586] Ex B4(1), pg. 14 & 15
[1587] Ex B4(1), pg. 16
[1588] Ex B4(1), pg. 17

falling into and becoming caught in the gap. Additional full width slats would have reduced the size of the gap between the conveyor head end and support frame, which would have likely reduced the engagement of the raft in the gap.[1589]

- Increased the severity at which the raft shook once it had fallen into the gap. If additional full width slats had been in place, this would have changed the size of the gap thus lessening the size of the compressive force imposed on the raft tube and plus, which would have resulted in less severe shaking.[1590]

- Upwardly bowed full width slats on the conveyor increased the probability of the conveyor engaging the raft and moving it forward forcefully.

- The distance between the support frame cross members was excessive. Dr Grigg noted that the distance between the first and second cross members was about 1450mm, with the second and third being 1270 mm. The distance between the support frame rails was 1450 mm. Accordingly, there was limited support to a raft plug, increasing the probability of the front edge of a downwardly pitched raft plug engaging with the third cross member.[1591] A central longitudinal member could have prevented the bottom of Raft 6's plug from engaging the cross member of the frame.

- The distance between the conveyor head end and the support frame was excessive.

854. Dr Grigg found that:

> The design of the conveyor, most notably the fitting of a full width slat to every 6th link (every 3rd outer link), gave rise to the risk of positive engagement between the slats and the bottoms of the plugs of the rafts as well as the tubes, so as to produce the force necessary to cause the raft being discharged from the conveyor to tilt upwards when it hit the rear of the raft that was stranded on the support frame as a result of the water level dropping. It also resulted in the violent shaking of raft #5 after it had been titled up and caught between the conveyor and the support frame.[1592]

855. Dr Grigg noted that an automatic shutdown of the conveyor in the event that one of the pumps failed would have prevented the incident from occurring.[1593] Furthermore, had a means of detecting a stranded raft in the unload area been installed, which stopped the conveyor, the tragic incident would have been prevented, as had been the experienced in 2001.[1594] In relation to the incident in 2001, Dr Grigg concluded that this *'provided clear operational experience of what could occur in the event that the movement of a raft became blocked after being discharged from the conveyor, even without pump failure and water level dropping'.*[1595]

[1589] Ex B4(1), pg. 17
[1590] Ex B4(1), pg. 17
[1591] Ex B4(1), pg. 17
[1592] Ex B4(1), pg. 18
[1593] Ex B4(1), pg. 17
[1594] Ex B4(1), pg. 18
[1595] Ex B4(1), pg. 18

Safety Related Control Systems, Summary Report 170326GRa, Expert Report by George Rutherford, 26 March 2017

856. Mr. George Rutherford, Technical Director from Projects etc Pty. Ltd was requested by OIR to attend Dreamworld immediately following the incident to assist with their investigation. Various site visits were subsequently undertaken, including observation of the re-enactment attempts carried out by QPS.[1596]

857. Mr. Rutherford is a qualified engineer and has various workplace health and safety competency training. For 25 years, he has been involved in Safety/ EMC Assessments and Testing for a wide range of Products, Plants (Machinery) and Systems against International and National Regulations and Standards.[1597]

858. Despite multiple requests, documentation relating to the TRRR, namely circuit diagrams, critical components lists, risk assessments were not provided to Mr. Rutherford by Dreamworld. He raised significant concern should these 'basic' documents not exist as they would *'likely lead to unsafe maintenance practices by Dreamworld Staff and perhaps inadequately safety design in rides'.*[1598] ***It is of note that documents of this nature were unable to be sourced by Ardent Leisure, and as such, have never been produced.***

859. Mr. Rutherford reached the following conclusions as a result of assessing the circumstances of the incident:[1599]

- The incident appears to have occurred due to the sudden lowering of the water level at the upper area of the ride. This resulted in the grounding of a raft at the exit side of the Conveyor, which was subsequently struck by the raft carrying Ms. Goodchild, Mr. Dorsett, Ms. Low and Mr. Araghi, as it was forced off the conveyor.[1600]

- The lowering of the water level is likely to have been caused by the south water pump stopping. Such a stoppage may have gone unnoticed and was possibly masked by the noise of the North Pump, which was still operating. Mr. Rutherford noted that he did not observe any difference in noise level when the south pump was started/stopped, nor was there a significant change in water turbulence.[1601]

- The lowering of the water level to a 'dangerous state', which could cause a raft to ground once the south pump had stopped, would have happened 'very quickly', and in Mr. Rutherford's opinion, far too quickly for a busy Ride Operator to take any appropriate action, *'even if it was clear to the operator what action they were meant to take'*.[1602] **He is of the view that the lowering of the water level should have been detected automatically.**

[1596] Ex B4(3), pg. 3
[1597] Ex C2(1)(a)
[1598] Ex B4(3), pg. 4
[1599] Ex B4(3), pg. 4
[1600] Ex B4(3), pg. 4
[1601] Ex B4(3), pg. 4
[1602] Ex B4(3), pg. 5

- The result of the raft collision was worsened by the air gap between the end of the conveyor and the metal structure (support rails) in the unloading/loading areas.[1603]The reasons for the large gap needed to be determined, particularly as this may have occurred inadvertently over time with the replacement of corroded parts, as opposed to by a deliberate design.[1604]

- The ride operation procedure appeared to be 'vague', with the Dreamworld technicians observed by Mr. Rutherford not to have been completely confident as to what components of the ride were stopped by the Emergency stop button at the Main Operator control panel.[1605]

- The modification carried out on the conveyor in early 2016 (installation of SIL 3), was confirmed to have been able to achieve the necessary level of safety.[1606]

860. In Mr. Rutherford's opinion, the **primary cause** of the tragic incident was *'the lack of a suitable safety rated water level detective system interfaced to the upgraded conveyor system – such a safety system could easily have been provided and at a minimal cost'.*[1607] He further states that the incident occurred as a result of a series of unfortunate events and timings, the absence of which had allowed the ride to operate for many years without incident. He opines that *'I feel lessons should be learnt from this unfortunate incident particularly the importance of a correct initial risk assessment/regular updating of that risk assessment and the need for correctly assessed/rated safety circuitry'*.[1608]

861. Further, whilst unrelated to the incident, Mr Rutherford highlighted the following issues associated with his observations of the TRRR:[1609]

- The interlocked lockout facility on the Main Operator control panel had NO level of safety designed into it and could have '*foreseeably failed dangerously (and undetected) in a single fault condition and would then not provide any protection against start-up of the ride'*.[1610]

- The emergency stop located above the Operator panel that stops the water pumps has NO level of safety designed into it, and only stops the north pump. It could foreseeably fail dangerously (and undetected) in a single fault condition and would then not provide any emergency stopping of the pump.[1611]

- Upon opening the Operator panel, a '*rat's nest of wiring'* was found, with some dangling disconnected wires with uninsulated ends. Mr. Rutherford was of the view that *'such a poor level of installation could lead to dangerous malfunctions of the ride including unexpected start-ups and even unexpected launching of rafts during loading.'*[1612]

[1603] Ex B4(3), pg. 5
[1604] Ex B4(3), pg. 5
[1605] Ex B4(3), pg. 5
[1606] Ex B4(3), pg. 5
[1607] Ex B4(3), pg. 6
[1608] Ex B4(3), pg. 7
[1609] Ex B4(3), pg. 5
[1610] Ex B4(3), pg. 6
[1611] Ex B4(3), pg. 6
[1612] Ex B4(3), pg. 6

- From the CCTV footage, it is clear that when the south pump stopped, a massive and fast backflow of water went into the outlet for which there was no guarding. If a patron had fallen into the water at such a time, there was a high likelihood that they would have been drawn into the pump outlet. Such a hazard could have been identified in a risk assessment of the ride, with appropriate countermeasures put in place.[1613]

862. On 7 July 2017, a further supplementary report was provided by Mr. Rutherford in relation to the feasibility of a water level detection system being added to the TRRR safety control system at the same time that the Conveyor Safety Control System was upgraded in 2016.[1614]

863. In relation to the above, Mr. Rutherford noted the following:[1615]

- Based on circuit diagrams provided by the new system installer company, there remained some spare capacity for additional safety sensors/safety outputs on the ABB Pluto D45 system. These inputs could have been used had a system to detect water level been installed in the load/unload area of the TRRR.[1616]

- A detection of the sudden lowering of the water level could have been achieved by a simple arrangement of suitable float switches in a 'baffled area' within the load/unload area. Otherwise, more sophisticated water level switches could have been made available on the controller by reconfiguring some of the inputs.[1617]

- In either case, a SIL 3 rating for the water level detection system would have easily been achievable. This would have brought the conveyor to a safe stop as soon as the water level had fallen to a critical level, thereby likely avoiding the collision of the rafts which resulted in the fatalities.[1618]

864. Mr. Rutherford estimated that the cost of such a water level detection system being supplied and interfaced with the safety controller already installed, including dual diverse water level sensors, cabling installation, programming and testing/validation, would have been around $2000-$3000, had it been carried out at the same time as the other modifications in February 2016. Mr. Rutherford confirmed his view that the *'primary cause of the tragic incident was the lack of a suitable safety rated water level detection system interfaced to the upgraded Conveyor system'.*[1619]

Report by Dr Duncan Gilmore, Managing Director and President of Gilmore Engineers Pty Ltd

865. For the purpose of the coronial investigation, an independent expert engineering review and assessment of the TRRR and incident was sought from Consultant Engineer, Dr Duncan B Gilmore, Director and President of Gilmore Engineers. An expert advice was subsequently provided.[1620]

[1613] Ex B4(3), pg. 7
[1614] Ex B4(4)
[1615] Ex B4(4), pg. 4
[1616] Ex B4(4), pg. 5
[1617] Ex B4(4), pg. 5
[1618] Ex B4(4), pg. 5
[1619] Ex B4(4), pg. 6
[1620] Ex I

866. Dr Gilmore was briefed with a selection of the relevant documentary, expert and visual exhibits contained within the inquest brief, deemed necessary to provide an expert opinion as to the questions posed. A schedule of this material was settled and provided to all of the parties for comment. No objection or submission to include further material was advised by any of the parties prior to the inquest hearing.

867. A summary of the general comments made as to the ride and incident, as well as advice as to the specific questions posed, are outlined below.

General comments as to the TRRR, past incidents and risk assessments

868. Having considered the design of the ride, Dr Gilmore notes that the ride is clearly dependent on an adequate water level. When this drops, the rafts settle on the steel supporting rails and cannot travel through the watercourse, which includes at the end of the conveyor discharge point. This means that rafts can collide before a raft has cleared the conveyor.[1621]

869. Dr Gilmore states that the behaviour of rafts in low water was not understood as there was no engineering controls on the water level; when it fell only administrative controls were in place. There was no critical water level for which the water should not fall below nor an acceptable time for the water level to be below normal.[1622]

870. Dr Gilmore noted that the presence of the unexplained, arbitrary and unnecessary horizontal 430 mm gap between the end of the conveyor and the steel support frames in the unload area allowed the raft that flipped to be jammed within the space. He opines that had this gap not been present, the dynamics of the incident may have been different, and the raft may have risen up vertically but not wedged.[1623] This would have been driven by the large slat gap and the presence of a raft in the unload area. It all originates, however, from a low water level and low water flow.

871. Dr Gilmore recognised that this particular incident was a '*high risk, low probability incident, similar to an aircraft losing engine power or having to ditch in water*'.[1624] This type of fault had seemingly not been experienced previously, although pump failure was not a new occurrence on the ride.

872. Dr Gilmore notes that the probable cause of the incident suggests that there has been a lack of 'design mind' behind the ride, which has been *'configured to perform an action without an overall design philosophy'.*[1625] The ride had been extensively modified over the past 30 years, with the original rotating platforms removed, underwater supporting steelwork frames added, conveyor slats removed, as well as many other features.

873. In Dr Gilmore's opinion, the root cause of the incident was a combination of events, namely an equipment failure (pump), leading to a water level drop, and a subsequent lack of timely recognition by staff of the importance of this event combined with shutdown action.[1626] He notes that the incident happened quickly

[1621] Ex I, pg. 18
[1622] Ex I, pg. 18
[1623] Ex I, pg. 18
[1624] Ex I, pg. 18
[1625] Ex I, pg. 19
[1626] Ex I, pg. 18

and required the Operators to react quickly to stop the conveyor, amongst the other tasks of loading and unloading guests. The best remedy, in his opinion, would have been the installation of engineering controls to monitor the water level and quickly shut down the conveyor belt should the pump fail.

874. Dr Gilmore further states that the 'design' of the ride should have been put through a rigorous risk assessment process initially when commissioned, and each time any modification was made, exploring all of the possible operating scenarios for the ride. The purpose of this would have been to uncover hidden low probability operating scenarios which may pose a risk to patrons.[1627]

875. In relation to Mr. Polley's assessment of the TRRR 27 days prior to the incident, Dr Gilmore notes that this was a 'cursory inspection' and not a risk assessment of the design and analysis of the operation of the ride for which a design fault or the like may be identified.[1628] It seems it was assumed that the ride was safe and will continue to be operated safely and appropriately.

876. In relation to the JAK audits, Dr Gilmore notes that whilst the level of risk assessment conducted is somewhat unknown, given no design modifications were recommended in any of the years they were engaged, it can be confidently concluded that a full risk assessment of the design and operation was not conducted.[1629] Dr Gilmore did note that a number of recommendations made by JAK, particularly in relation to the labelling of buttons, were not carried out by Dreamworld.[1630] Dr Gilmore notes that pictures of the ride taken at the time of the incident demonstrates that the buttons at the Main Operator control panel remained unlabelled.

877. In 2013, JAK recommended that an 'Emergency shutdown' procedure be posted on the wall of the ride and that a simpler process be considered, such as a singular emergency button. This recommendation was not actioned by Dreamworld, with the risk being deemed as 'acceptable'.[1631]

878. Having considered a wealth of records provided by Ardent Leisure for the purpose of the coronial inquiry as to the history of the TRRR, Dr Gilmore concluded that there was no evidence a thorough risk assessment and questioning/analysis/review/testing of the design of the TRRR was ever conducted.[1632] Dr Gilmore stated that:

> *Based on the ability of the failure of one pump in 2016 to lower water levels to critical and unsafe values at the unloading zone, without being safeguarded by an engineering control, an ability which seemingly has been in place for the 30 year life of the ride, it is my opinion that a risk assessment of the ramifications of the design methodology of the ride was never conducted initially in 1985/1986 during design and construction, and has not been conducted thoroughly since that time.*[1633]

[1627] Ex I, pg. 20 & 21
[1628] Ex I, pg. 6
[1629] Ex I, pg. 7
[1630] Ex I, pg. 7
[1631] Ex I, pg. 7 & 8
[1632] Ex I, pg. 8
[1633] Ex I, pg. 8

879. With respect to the previous incidents on the TRRR, in particular that which occurred in 2001, Dr Gilmore noted that:[1634]

- No engineering controls were implemented subsequently to prevent such an impact, and administrative action was instructed.

- The incident in 2001, in Dr Gilmore's opinion, should have been sufficient to instigate installation of engineering controls and an investigation of what caused the rafts to tilt vertically and bunch up at the conveyor exit.

- This experience was first hand at Dreamworld and was available for implementation immediately and further testing as desired. It was a lost opportunity not to have followed through and subsequently modified the design of the TRRR, making it safer for patrons and potentially avoiding the October 2016 incident.

Specific Issues to be considered

880. Dr Gilmore was requested to consider the following specific issues, the answers of which are outlined below:

I. Whether the initial construction of the TRRR was compliant with the requisite Australian Standards in place at the time (as can best be determined from the material available)? Particular comment is requested in relation to the appropriateness of the design of the conveyor slope.[1635]

- The TRRR was most likely generally compliant with Australian Standards in place in 1986.

- There is no information available as to whether a risk assessment was conducted by a designer in 1986.

II. *Whether the modifications made to the TRRR were in breach of the requisite Australian Standards particularly those applicable to the construction of the conveyor and the installation of guiding rail?*[1636]

- The modifications made to the ride, including the removal of the conveyor slats, removal of the turntable and installation of supporting steelwork in the water, represent major alterations to the physical construction of the ride and should have been configured by a designer or 'competent person' with tertiary engineering qualifications and experience (AS-3533.1-2009 and AS-3533.2-2009).

- In addition, such modifications should have been subject of a detailed and exhaustive risk assessment investigation, and should have also been registered with OIR.

[1634] Ex I, pg. 10
[1635] Ex I, pg. 21
[1636] Ex I, pg. 22

III. *Whether the TRRR, as it was on 25 October 2016, complied with the requisite Australian Standards in place at the time?*[1637]

- Australian Standards cannot stipulate guidelines for the construction and maintenance of every type of component which might be required in an amusement ride. The Standards allow for individuality by delegating responsibility to a 'designer' or 'competent person' with tertiary qualifications in engineering and experience.

- Current AS-3533.1-2009 and AS3533.2-2009 both require the regular risk assessment of the design and any modifications by a person nominated as the 'designer' by the proprietor, or an appointed suitable 'competent person'. With respect to the TRRR, there was no evidence that a thorough risk assessment and analysis/review/testing of the design of the TRRR was ever conducted or attempted.

- The design and construction of the TRRR did not comply with the requirements of the Australian Standards in place at the time.

IV. *What risks did the design and construction of the TRRR, including the various modifications made, pose to patrons?*[1638]

- Given the TRRR operated successfully and injury/fatality free for approximately 30 years indicates that for the majority of its lifetime, the design and construction of the ride posed little risk to patrons. However, as built at the time of the tragic incident, it is Dr Gilmore's opinion that the design and construction of the TRRR in the conveyor/unload zone posed a significant risk to the health and safety of patrons. The risks include:

    - Electrical faults of unknown origin existed in the power circuit.

    - If one pump failed, the water level on which proper operation of the ride relied dropped dramatically.

    - Two-thirds of the conveyor had been removed, which created a gap into which the rafts might lodge between the slats and be pushed forcefully by the conveyor, rather than allow the slats to slip and slide uneventfully beneath the raft.

    - If the water dropped in the unload zone, a raft would drop and rest on supporting steelwork in the trough, which prevents a raft from moving forward and away from the exit region of the conveyor.

[1637] Ex I, pg. 22 & 23
[1638] Ex I, pg. 23 & 24

- When a raft is pushed along forcefully by the conveyor and came into contact with a stationary raft on the supporting steelwork in the unload zone, the rear raft was caused to ride up and over the raft ahead, flipping it vertically. Once flipped and tilted the raft was drawn into the gap created between the end of the conveyor and supporting steel work. Dr Gilmore is of the view that the gap should never have been present. Had it been minimal, the raft may have flipped, but the outcome for the occupants may have been different, although a risk of bodily crushing injuries remained. Dr Gilmore noted that *'being tilted and under threat of being spilled onto a moving slat conveyor is however a catastrophic event and one which should have been guarded against under any circumstances'.*[1639]

- The seat belts were only ever intended to brace passengers against inadvertently falling into the water, with the seats not designed to be in any way protective for a tipping event.

- The Main Control Panel had no emergency stop button, which could stop the conveyor.

V. *What engineering measures could have been implemented to prevent a similar incident from happening?*[1640]

- The following engineering measures could have been implemented:

  - Promptly investigate and control electrical faults occurring in the pump circuit.

  - Install a control function to shut down the conveyor if a pump fails or the water level drops to a critical level where rafts do not float in the unload area.

  - Install a heightened water intake mouth on the pumps to maintain water level at a satisfactory level if one pump failed.

  - Size the pumps so that the water level can be maintained on one pump alone.

  - Remove supporting steelwork from the unload/load area trough.

  - Install other means of ensuring stable and slow raft movement in the unload/load areas if required.

  - Install proximity sensors in the rafts so that if they become overly close in the unload zone, the conveyor

[1639] Ex I, pg. 24
[1640] Ex I, pg. 24 & 25

is stopped.

- Reinstall all conveyor slats to ensure that the conveyor will slip underneath the rafts and not forcefully engage with their base.

- Install an emergency conveyor stop button at both the main and unload control panels.

- Consider protective seat structures and seats which will protect patrons from injury if the raft is tipped.

VI. *Were the previous risk assessments and maintenance of the TRRR undertaken internally by Dreamworld, and those commissioned by external providers namely DRA, JAKS and Mr. Tom Polley, sufficient to identify risks associated with the TRRR?*[1641]

- Risk assessments were not commissioned from external providers DRA, JAKS or Mr. Tom Polley.

- JAKS conducted a visual inspection of the ride with respect to safety and compliance, rather than a risk assessment. Given no design modifications were recommended in any of the years, Dr Gilmore confidently concludes that a full risk assessment of the design and operation was not conducted.

- Mr. Polley's inspection was cursory and not a risk assessment of the design with analysis and demonstration of the operation of the ride.

- Maintenance conducted by Dreamworld can only be inferred from the pre-service inspections.

- **There is no evidence that a thorough risk assessment and questioning/analysis/review/testing of the design of the TRRR has ever been conducted.**

VII. *Please consider the content of the safety bulletin from OD Hopkins (ODHA 00-1) issued in March 2000 and provide comment on the content and how it may have applied to this tragic event?*[1642]

- The relevant items from the Bulletin were (1) the need to immediately activate an emergency stop on a ride if a raft gets jammed or hung up any way; (2) critical to maintain water levels; and (3) aviator type seat belts, with Velcro belts also acceptable.

- All the items recommended, following incidents on raft rides carrying guests turned over during the course of the ride, were nominally enacted by Dreamworld, including an emergency stop button (which was not readily accessible to the Operator in charge), the awareness of staff that the water level needed to be maintained, and Velcro seat belts were in use.

[1641] Ex I, pg. 25
[1642] Ex I, pg. 26

VIII. *In light of the tragedy of this incident are there any changes that could be made to the Australian Standards or present regulatory system for amusement rides in Queensland which may prevent a similar incident from happening in the future?*[1643]

- Current WHS Regulations and Australian Standards as are in place are adequate.

- Changes are required to the tightening of the checking and enforcement process i.e. full risk assessments and inspections are actually conducted and fully reported, recommended engineering, administrative and protective equipment controls are properly implemented together with documentation of the history and maintenance. This could be performed by having the requirements independently certified annually by an RPEQ in a similar manner to the annual inspections for mechanical and structural adequacy, together with random spot checks of documentation by WHS Queensland.

- Evidence suggests that prior to 2016, the system of ensuring compliance of amusement rides with Australian Standards and WHS Regulations had been unsuccessful at Dreamworld.

IX. *In your opinion are there any other issues arising from this tragic event, which need to be considered and addressed in order to ensure a similar incident that can occur in the future? If so what measures need to be undertaken?*[1644]

- Dr Gilmore recommended the following measures:

    - Initiate a formal document and control systems for each ride. Appoint a 'designer' or 'competent person' for every ride, registered with WHS Queensland, with tertiary qualifications in engineering and experience.

    - An external party (RPEQ) to be used to conduct independent risk assessments.

    - Specify that a full risk assessment on the whole ride be conducted at least every 5 years or each time new hardware/electrical modifications or additions/subtractions are performed.

    - Spot checks by OIR to ensure proper conduct and thoroughness.

    - Regulations should make it clear the onus placed on the RPEQ when conducting an annual inspection or a risk assessment.

    - The operation of the ride should be visually observed during a risk assessment.

[1643] Ex I, pg. 27
[1644] Ex I, pg. 28 & 29

- Look for probability failures – *the excuse that the ride has been trouble free for 30 years is not an acceptable excuse. History shows that low probability coincidences often turn out to be the cause of a major unexpected incident.*

- Observe how the machine handles adverse events.

- Consult Theme Park records internally and internationally.

- Look at design records.

- New designs should be documented to reveal the design methodology, what was considered, safety considerations, log and register with WHS Queensland to keep centrally.

- Testing must be carried out and be comprehensive.

ENGINEERING EXPERT CONCLAVE

881. The expert engineering evidence in relation to this incident was heard concurrently during the inquest by way of a conclave. Accordingly, Dr Frank Grigg, Dr Duncan Gilmore and Mr. George Rutherford gave evidence as a panel, and a joint expert advice was tendered.[1645]

Joint Engineering Expert Advice

882. Following the provision of further short answer written responses by each of the experts,[1646] and a teleconference with Counsel Assisting, a joint advice opinion was provided by Dr Grigg, Dr Gilmore and Mr. Rutherford. It was acknowledged that given the differing areas of engineering expertise, the opinions expressed by Mr. Rutherford in answer to the questions posed were limited to Risk Assessment Concepts, Safety Related Control Circuit Concepts and Electrical Safety Concepts. Statements made, which were not specifically attributed to Dr Grigg or Dr Gilmore, were intended to be read as opinions shared, given their area of practice and expertise.

883. Relevant excerpts from this advice, as well as the evidence provided during the inquest proceeding, is summarised below.

(1) Whether the initial construction of the Thunder River Rapids Ride was compliant with the requisite Australian Standards in place at the time?

Standard in place at the time of construction

884. It was agreed amongst the experts that there was no key applicable Australian Standard (AS) in place at the time the TRRR was commissioned in 1985/1986. The first edition of the AS-3533: Amusement Rides and Devices was published in 1988. Section 1.3.20 relates to *Amusement Rides and Devices*, including 'Raft

[1645] Ex I5
[1646] Ex I2-4

Rides' like the TRRR.[1647] Accordingly, the ride was required to satisfy the District Inspector, OIR that it complied with other safety standards, which it appears to have done based on the material available in relation to the initial design and registration.[1648]

885. Mr. Rutherford is of the view that no similar standards (which are now current for the area of *Safety Related Control Circuits)* existed at the time of the initial construction of the TRRR. However, traditional 'electro-mechanical' type interlocking & non-safety controllers (of a lesser level of reliability compared to equivalent systems used today) were already in existence, and may well have been applied.[1649] He further notes that with respect to electrical safety requirements, which were in place at the time, such as the National Wiring Rules, would have likely resulted in adequate electrical safety had it been installed to a professional standard. Mr. Rutherford is of the view that the *Safety Related Control Systems* and *Electrical Safety* of the TRRR were probably in line with standard practices at the time of initial construction, however, have become non-compliant with current practices over time.[1650]

AS-3533 - 1988

886. Upon release of AS-3533-1988, the view shared by the experts was that best practice would have been to ensure the TRRR complied with the Standards, although no action was mandated.[1651]

887. At inquest, Dr Grigg further explained that 'best practice' in this instance would have been to take all precautions suggested in the Standard, even if they weren't mandatory, with a common sense consideration of the risks present for the ride and rectification by way of engineering solutions where possible.[1652] Dr Gilmore further noted that 'best practice' would be to take the most updated advice given in relation to safety, per the Standards.[1653]

888. With respect to the requirements of AS-3533-1988, the following were noted in relation to the TRRR:[1654]

    i. It appears on the documentation available that the TRRR would have complied with the AS-3533-1988 design requirements for Rafts (s. 4.4.10) and Flumes (s. 4.4.10.2) when the ride was first opened. However, Dr Gilmore noted s.4.4.10(b), which stipulated that the depth of the water in the flume shall be the minimum necessary to maintain floatation of the raft when fully loaded, does not appear to have been adhered to. The water course on the TRRR was substantially deeper than that necessary for floatation and increased the risk of drowning. Dr Grigg notes, however, that the water depth near the head end of the conveyor may have been greater than that in other parts of the ride due to the horizontal discharge of the original pump.

[1647] Ex I5, pg. 1
[1648] Ex I5, pg. 1; T30-20, lines 1-30
[1649] Ex I5, pg. 1 & 2
[1650] Ex I5, pg. 1 & 2
[1651] Ex I5, pg. 2
[1652] T30-20, lines 28-45
[1653] T30-21, lines 1-5
[1654] Ex I5, pg. 2

ii. It is unknown whether the TRRR would have complied with AS section 7: *Maintenance and Inspection,* particularly those pertaining to Logbook (s. 7.5), Section 9: *Information provided by the manufacturer*, and Section 10: *Marking.* At inquest, the experts agreed that it was unclear as to compliance in this regard due to the lack of documentation available, kept or retained in relation to the TRRR.[1655]

iii. Given the loading and unloading components of the ride design when first commissioned involved a turntable, which was removed at some time before 1998, it cannot be determined whether the original installation would have provided unrestricted views of all embarkation and disembarkation stations, as was required by Section 3.13: *Controls Stations.*

iv. Having considered the control arrangements found in place after the tragic incident, it appears that the Operator at the Main Control Panel may not have had safe control of all functions in an emergency, per s.3.13(c), which includes the absence of an emergency stop button for the conveyor. Additionally the "Conveyor Stop" and "Emergency Stop" (which only Stopped the North Pump) and likely all other "safety functions" (e.g. Raft Release etc) were not designed/implemented as "safety related features" but were of low reliability and subject to failure in the case of a single fault occurring.

v. No edition of the AS-3533 applicable to Design and Construction (1988 or subsequent) deals directly with the design, construction of, or modifications to a conveyor.

(2) Whether the modifications made to the TRRR were in breach of the requisite Australian Standards, particularly those applicable to the construction of the conveyor and the installation of the guiding rail?

889. The experts found that the known mechanical modifications to the TRRR, which are relevant to the incident, were as follows:[1656]

i. ***Conveyor slats:*** Whilst it seems that every second slat of the conveyor was removed in 1989/90, it is unclear when the removal of every third slat took place.

ii. ***Removal of the Turntable:*** It appears that the turntable passenger loading and unloading device was removed in the early 1990's, with the support rails in the unload area being installed at the same time.

iii. ***Addition of raft support rails in the unload area*****:** Whilst the specific date of the installation of the support rails downstream from the conveyor is unknown, it seems that these may have been put in place at the time of the removal of the turntable. It was noted, however, that the rails in place at the time of the incident were younger than expected, and therefore may have

[1655] T30-21, lines 5-38
[1656] Ex I5, pg. 2 & 3

been replaced and/or moved since the original installation.

890. It appears probable that the majority of the modifications were made to the TRRR when AS-3533-1988 was in place.[1657] Accordingly, reference to modifications was made in Appendix H: *Statutory Approval, Section H4 – Modification and Alterations,* which states that modifications, which may cause increased stresses or 'otherwise affect safety', are deemed to make the unit a new model and new approval may be required.

891. In 1997, AS-3533-1988 was expanded to include *Hazard Identification, risk assessment and risk control measures* (s.2.2). Accordingly, if the modifications to the TRRR were made before the introduction of the 1997 Standard, there was no strict requirement for a reassessment of the safety of the TRRR, unless further modifications made were considered to constitute a redesign, pursuant to the application of AS-3533.1-1997.[1658]

892. The experts were of the view that in modifying the original design of the conveyor (removal of the slats) and the installation of the support railing at the unload area, a "designer" should have consulted with a documented risk assessment of the hazards envisaged to be introduced or altered undertaken. These alterations would have amounted to a new design, and should have been re-registered with the Regulator. Notification of these modifications should have been made to the Regulator.[1659]

893. AS-3533.2-1997 described the requirements for the operation, maintenance and inspection of fixed amusement rides and should have been considered in relation to the TRRR. Specifically,

i. ***Section 5 – Maintenance, Replacement, Repair and Inspection*** – specifically, s.5.1, which includes:

> *….*
> *Following major maintenance and repair, and at random intervals on other occasions,* ***a hazard identification and risk assessment procedure*** *should be completed to ensure new hazards are not present, and residual risks identified by the designer or manufacturer are not increased.*
>
> *NOTE: A typical hazard identification and risk assessment procedure is given in Appendix F.*

ii. ***Appendix F – Hazard Identification, Risk Assessment and Risk Control Process*** – This Appendix explicitly details *Mechanical Hazards* for consideration as part of the hazard identification and risk assessment process, which includes those involving crushing, shearing and entanglement.

AS-3533.2-2009 provides almost identical guidance as that provided in Section 5.1 of 1997 Standard, with more substantial guidance provided for in Appendix F, and reference directly to

[1657] Ex I5, pg. 3
[1658] Ex I5, pg. 3
[1659] Ex I5, pg. 3

AS 4360-1995 – Risk Management.

894. It was agreed by the experts that AS 3522.2-1997, s.5.1 should have triggered a mechanical hazard identification and risk assessment of the TRRR on a number of occasions during the operating period after the 1997 edition of the Standard was in place.[1660] If a hazard identification and risk assessment procedure, as per the recommendation of Section 5.1, had been completed following the implementation of any of the relevant modifications, it is most probable that some safety issues associated with at least the removal of the full width conveyor slats and the installation of the support rails, would have been identified.[1661]

895. At inquest, it was agreed that s.5.1 essentially reflected what was 'best practice' for amusement device owners at the time in relation to the process to be undertaken should any modifications be made to the ride.[1662]

896. Given the TRRR 1991 Operator Procedure Manual identified the events '*loss of power to one or both pumps*' and '*person in the water*' as 'emergency situations', consideration should have been given to mechanical hazards associated with these situations in any hazard identification and risk assessment, regardless of the requirements of the Australian Standards or Regulations.[1663] Such an assessment would have considered the **underwater risks** to a "person in the water", of which some of the obvious include:

    A. The excessive gap between the full width conveyor slats posed a significant risk of injury to any person who fell onto the conveyor whilst it was in operation;

    B. The area between the head of the conveyor and the support rails posed a significant mechanical hazard;

    C. The clearance between a moving raft and the support rails was a shear/pinch point; and

    D. The support rails could have been considered an entrapment hazard.

ii. If the event of 'loss of power to one or both pumps' had been risk assessed, it should have indicated that when the water level dropped:

    A. The ride would have been operating outside of its design envelope and there was at best a significant risk of property damage or at worst a significant risk of injury to patrons.

897. Given the unclear history for the various changes (both electrical and mechanical) that have occurred over the years since the initial installation of the TRRR, it appears that most of the ride has been modified in an undocumented way with little or no consideration being given to the effect of safety via a detailed and formal risk assessment process. As such, hazards were never identified by

[1660] Ex I5, pg. 4
[1661] Ex I5, pg. 4
[1662] T30-21, 22 lines 1-20
[1663] Ex I5, pg. 4

a designer with a risk assessment being undertaken.[1664]

898. In relation to the importance of risk assessments for amusement rides, during the inquest, Dr Grigg noted that:[1665]

> *…the important thing about doing a risk assessment is to try and think about the possibilities of what could happen under virtually all circumstances, and to take appropriate action to minimise those risks. In some cases, it mightn't be possible to completely eliminate a risk.*
>
> *But you've got to be aware of what the risk is and you may need – if you can't come up with an engineering solution, it may be that you've got to rely on some sort of administrative control by putting – having people telling patrons what they've got to do and what they've got to look out for, or something…*
>
> *But nevertheless you've got to identify that the risks exist.*

899. All of the experts concurred that the previous incidents on the TRRR, particularly in 2001 and 2014, should have alerted Dreamworld to the hazards present on the ride.[1666] These incidents should have prompted a thorough risk and hazard assessment of the ride, including the design, looking beyond the circumstances of the incident. In accordance with the hierarchy of controls, elimination of the risk, plant and engineering controls should have been considered as solutions to identified hazards before administrative controls.[1667]

(3) Whether the TRRR, as it was on 25 October 2016, complied with the requisite Australian Standards in place at the time?

900. AS-3533.2-1997 and subsequent editions describe the recommendation in section 5.1 for hazard identification and risk assessment (including mechanical hazards) to be performed at reasonable intervals, and the requirement of the involvement of 'competent persons' in these tasks. It also describes other maintenance, replacement, repair and inspection activities. The documentation available in relation to the TRRR clearly shows that whilst a number of audits and 'risk assessments' were performed on aspects of the ride, the identification and assessment of mechanical hazards was rarely considered and when it was, it was not considered to the extent recommended by AS-3533.2.[1668]

901. It is clear that the maintenance documentation, including logbook records (s.5.5 AS-3533.2) did not comply with the Standard, and because of this, relevant information regarding modifications and alterations were not communicated to or assessed by competent persons.[1669]

902. There were no directly relevant safety designs applicable to the conveyor at the time of the incident of concern. Mr. Rutherford further noted that although the AS 1755 (now superseded by AS/NZS 4024 Parts 36XX), which covers conveyors,

[1664] Ex I5, pg. 4
[1665] T30-23, lines 2-25
[1666] Ex I5, pg. 4; T30-35, lines 8-47
[1667] Ex I5, pg. 4
[1668] Ex I5, pg. 5
[1669] Ex I5, pg. 5

states that conveyors specifically designed to carry people are not covered by these Standards, any Risk Assessment carried out under the AS/NZS 4024 (Safety of Machinery) should have identified the pinch/draw-in/shear hazards at the end of the conveyor.

903. Mr. Rutherford notes that other than the modifications made to the Conveyor Control System by PFI, other parts of the TRRR *Safety Related Control System*, including existing controls for the 'Prevention of Start-Up', 'Water Pump Emergency Stop', 'Conveyor start/stop' and possibly other "safety features" (e.g. Raft Release etc) at the Main Operator Panel were not in compliance with the Standards for *Safety Related Control Circuits* at the time of the incident. Additionally, the state of the electrical wiring within the Main Operator control panel and apparent lack of documented electrical circuit diagrams and critical components list could have impacted on the safety of the ride during any maintenance and modifications being performed.[1670]

(4) What risks did the design and construction of the TRRR, including the various modifications made, pose to patrons?

904. It was recognised by the experts that the TRRR had operated successfully and injury/fatality free for almost 30 years. As such, for a majority of its lifetime it seems that the general design and construction of the ride may have posed little risk to patrons. However, at the time of the fatal incident, the design and construction of the conveyor and unload area posed a significant risk to the health and safety of patrons.[1671]

Specific hazards associated with the design and operation of the TRRR:

905. As it was at the time of the incident on 25 October 2016, the experts agreed that the design and construction of the TRRR in the conveyor/unload zone posed a significant risk to the health and safety of patrons.[1672]

906. The following specific hazards associated with the design and operation of the ride were identified:[1673]

i. The wide spacing of the slats of the conveyor would have created a much greater risk of injury to a person who had fallen into the water in the vicinity of the conveyor or had otherwise interacted with the conveyor whilst it was operating. This spacing of slats also gave rise to the risk that the plug of a raft would engage on a slat causing the raft to be pushed forward positively, rather than simply slipping and sliding uneventfully beneath the raft, in the event of the forward movement of the raft being obstructed.

ii. The gap between the slats at the head end of the conveyor and the steel support frame was much larger than necessary. This gave rise to the flotation collar of raft number 5 being able to fit into the gap when the raft tilted; and this resulted in the occupants of the rear seats of the raft

[1670] Ex I5, pg. 5
[1671] Ex I5, pg. 5
[1672] Ex I5, pg. 5
[1673] Ex I5, pg. 5-7

being struck by the slats of the conveyor. Had the gap been minimal, the raft may have flipped and the occupants jostled, but the outcome may have been somewhat different. Being tilted and under threat of being spilled onto the moving slat conveyor is a catastrophic event and one which should have been guarded against under any circumstances. Falling towards the slat conveyor which is powering onwards can only lead to body crushing injuries.

iii. The head end of the conveyor being unguarded would have created a high risk of injury to a person who had fallen into the water in the vicinity of the conveyor or otherwise interacted with the conveyor whilst it was operating.

iv. The installation of the steel support frame and rails would have created a much greater risk of injury to a person who had fallen into the water by creating pinch/shear points with the raft movements and also increasing the probability of entanglement and drowning. However, it is recognised that the frame probably assisted in stabilising the rafts at the load and unload stations as well as being of assistance when inspecting the undersides of the rafts.

v. Electrical faults of unknown origin existed in the pump power circuit. These occurred randomly.

vi. If one pump failed, the water level on which proper operation of the ride relied dropped dramatically and quickly at both the unloading and loading stations.

vii. If the water level dropped in the unload zone, a raft in that zone would drop and rest on steel support frame, which had been installed in the trough. This undoubtedly allowed patrons to disembark safely if the water level was low, but it stopped the raft moving forwards and away from the exit region of the conveyor, creating a blockage.

viii. From the information provided, it is unable to be determined whether the removal of the turntable at the unload area of the TRRR increased the risk of exposing patrons to mechanical hazards. Information available suggests that the operation of the turntable may have reduced the Operator workload, and lessened the risk of rafts jamming or colliding in the unload area. However, without more detailed information as to the construction of the turntable, the comparative level of risk cannot be adequately determined.

ix. It appears that the seat belts were only ever intended to brace passengers against inadvertently falling into the water as the raft travelled around the waterway on rough waves. The seats were not designed to be in anyway protective for a tipping event i.e. they were not steel reinforced so that they might protect their occupants and cause the conveyor to stall rather than crush both the seats and patrons.

x. The Main Control Panel had no emergency stop button, which would stop the conveyor immediately.

xi. Mr. Rutherford notes that parts of the TRRR *Safety Related Control System*, including existing controls for 'Prevention of Start-Up', 'Water Pump Emergency Stop', 'Conveyor start/stop' at the Main Operator Panel were not in compliance with the Standards for 'Safety Related Control Circuits' at the time of the incident. They were not designed to have any particular level of safety reliability and could have malfunctioned in the case of a single foreseeable fault condition. The "Conveyor Stop" function at the Main Control Panel was not designed as a "safety stop". It is designated as a Category 2 Stop under AS/IEC 60204-1, which could fail to stop the conveyor in a single fault condition.

907. It was noted by Dr Gilmore during the inquest that none of the other comparable international rides had a similarly configured conveyor to the TRRR. Rather, the slats were closer together preventing a person from falling through into the water or mechanism.[1674] Dr Grigg notes that it is unknown why the gap in this area is so big, and he suspects that it was done without anyone considering the implications.[1675]

908. Dr Grigg and Dr Gilmore both agreed during the inquest that any competent person conducting a risk and hazard assessment of the ride would have easily identified a risk associated with the slat spacing, as well as the other aspects of the formation of the ride as outlined above.[1676] All of the experts strongly rejected any suggestion that their conclusions in this regard as to the obvious nature of the hazards on the ride were influenced by 'hindsight biased' or knowledge of the tragic incident.[1677]

909. Mr. Rutherford highlighted during the inquest that the changes and modifications made to the TRRR over its 30 years in commission not being documented was a 'major issue'.[1678]

(5) The cause of the incident on the TRRR

910. In general terms, the experts were of the view that the incident occurred as a result of an equipment failure (south pump), leading to a water level drop, following which the conveyor was not stopped.[1679]

911. The experts agreed that the following sequence of events transpired on *25 October 2016*:

i. Drop in the water level due to failure of the southern pump.

ii. Continued operation of the conveyor.

iii. Contact between the Raft (#5) and the lead raft (#6).

[1674] T30-25, 26, lines 1-35
[1675] T30-31, lines 20-30
[1676] T30-31, lines 1-45
[1677] T30-144-147
[1678] T30-68, lines 2-5
[1679] Ex I5, pg. 7

iv. Forceful engagement of the Raft (#5) by the conveyor.

v. The lead raft (#6) snagged on support frame.

vi. Raft (#5) entered gap between conveyor and support frame.

912. It was the view of the experts that if any of the above events had been avoided, the incident would not have occurred. It is considered that a change of any one of the engineering measures identified in *Question 6* would probably have prevented the disastrous outcome. **Significantly, whilst the water level drop was a primary cause of this incident, there were multiple other hazards evident on the ride, as outlined previously (conveyor slat removals, nip point etc.), which could have caused other catastrophic incidents to occur at any time**.[1680]

913. Dr Grigg also noted that Raft #6 was heavily loaded towards the front and very lightly loaded at the rear. Raft #5 was heavily loaded at the rear. These distributions may have contributed to the interactions that the lead raft (#6) had with the support frame, and Raft #5 had with the conveyor. Differences in raft passenger weight distribution may in part have explained why a similar incident did not occur in 2014, when rafts came into contact at the same location.[1681]

914. The experts also noted that a number of human factors associated with the failure of the procedures to enable a rapid response to an emergency situation also appeared to have contributed to the tragic outcome, including:[1682]

i. Delay in action because of the procedural requirements of Operators, including the multitasking required of the No. 1 Operator and the requirement of the No. 2 Operator to alert the No. 1 Operator.

ii. Inadequate alarms to alert the No. 1 Operator.

iii. Multi-step shutdown procedure, which caused a delay in isolating critical machinery (conveyor).

iv. The memorandum, dated 18 October 2016, requiring the Unload Platform E-Stop only to be pressed if the Main Control Panel cannot be reached.

v. Insufficient training of the Operators, especially in actions required in an emergency situation.

vi. Inadequate recognition or downgrading of what constitutes an emergency. In the June 2016 edition of the Operators Procedure Manual, the only identified emergency event was *person in water and/or raft capsized.*

915. Dr Gilmore noted that, in his opinion, the root cause of the incident was that a combination of events occurred for which the outcome was uncertain and unknown. Staff (operational and technical design and maintenance), as well as

[1680] Ex I5, pg. 7; T30-41 & 42
[1681] Ex I5, pg. 7 & 8
[1682] Ex I5, pg. 8

auditors and annual inspectors had never been alerted or aware that this combination of events could pose a threat. The ride design should have been put through a rigorous Risk Assessment process initially when commissioned, and each time any modification was made, exploring all possible operating scenarios for the ride.[1683]

916. Dr Gilmore further stated that the TRRR was internally manufactured, as opposed to being purchased from an international manufacturer, the onus for identifying necessary periodical safety upgrades, thoroughly analysing and documenting the implications of any modifications to equipment, and conducting risk management audits would rest totally with the owners of the TRRR.[1684]

(6) What engineering measures could have been implemented to prevent a similar incident from happening?

917. The experts were of the view that a number of engineering measures could have been implemented to prevent a similar incident from occurring. Namely:[1685]

(a) Installation of a control function to shut down the conveyor if a pump fails or the water level drops to a critical level where rafts do not float in the unload area. Mr. Rutherford noted that had there been an appropriately safety rated, designed and installed automated detection system for the water level as of the date of the incident, which was suitably interfaced to the *Conveyor Safety Control System*, the tragedy may have been avoided. Such water level sensing systems are now common place on modern rides and can be easily retrofitted in cases that their existence will enhance safety on older rides. Other means of stopping the conveyor movement in the event of a drop in water level, such as interfacing to the Pump Operation circuits, could also have achieved a similar safe result.

(b) Size the two pumps so that the water level can be maintained on one pump alone. Dr Grigg noted, however, that the two pumps installed are very powerful, and it is considered likely that for power supply reasons it was necessary to use two pumps so that their starting did not occur simultaneously and thereby create a very substantial peak load on the power supply. It is not apparent that one pump would be more reliable than two.

(c) The E-stop for the conveyor at the unload station should have been clearly labelled, and its function should have been duplicated at the Operator's control station so that in an emergency the conveyor could be stopped as quickly as possible.

(d) A central longitudinal member in the steel support frame may have moderated the degree of obstruction of the forward movement of raft number 6, thereby reducing the risk of the lead raft snagging and the rafts tipping up. Alternatively, removal of the supporting steelwork from the unload/load area trough could be considered. However, it was noted that the removal of this steelwork may have resulted in undesirable instability of the rafts during unloading and loading.

[1683] Ex I5, pg. 8
[1684] Ex I5, pg. 8
[1685] Ex I5, pg. 9

(e) Dr Gilmore suggests the installation of other means of ensuring stable and slow raft movement in the unload/load areas if required, to prevent rafts from becoming stationary in the unload area. Dr Grigg questions the cost effectiveness of such an arrangement.

(f) The spacing of the slats on the conveyor should have been much closer or an alternative conveyor design used.

(g) The gap between the slats at the head end of the conveyor and the steel support frame should have been only sufficient for reliable operation, and probably no more than about 100mm.

(h) Consider protective seat structures and seats, which will guard patrons from injury if the raft is tipped. The seat belts must be quick release, however, as the danger of drowning persists. AS3533.1 – 2009 section 2.8.10.4.1, specifically prescribes quick release fittings only with no metallic buckles. Dr Grigg was of the view that properly installed aircraft style lap seatbelt with a positive latching mechanism should have been used instead of the Velcro belt.

(i) Install proximity sensors in the rafts so that if they become overly close in the unload zone, the conveyor is stopped. Dr Grigg, however, questions whether this would achieve the desired outcome.

(j) Promptly investigate and correct electrical faults occurring in the pump control circuit.

(7) Were the previous risk assessments and maintenance of the TRRR undertaken internally by Dreamworld, and those commissioned by external providers namely DRA, JAKS and Mr. Tom Polley, sufficient to identify risks associated with the TRRR?

918. The experts unanimously agreed that the response to this question was no.[1686] The risk assessments, maintenance and inspections of the TRRR described in the brief were insufficient and did not meet the recommendation of AS-3533.2-1997 (and later editions) or AS/NZS 4024. This was because *Hazard Identification* and *Risk Assessment Procedures* (s. 5.1 and Appendix F) were lacking. It is not clear who was nominated as the qualified ride 'designer' or 'competent person' with responsibility for the design overview and initiation of all ongoing modifications.

919. AS-3533.2-1997 separately describes the requirement for Annual inspections (s. 5.4.2) and the recommendation for *Hazard Identification* and *Risk Assessment Procedures* (s. 5.1 and Appendix F). There was no indication in the records produced by Ardent Leisure of an 'Annual Inspection' as defined by the Standard having been performed prior to 2016.[1687]

920. The experts agreed that Mr. Polley's inspection in 2016, would have met the general requirements for an 'annual inspection' as described in AS-3533.2-2009.[1688] However, his inspection was cursory in nature and not a risk assessment of the design with analysis and demonstration of the operation of

[1686] Ex I5, pg. 10
[1687] Ex I5, pg. 10
[1688] Ex I5, pg. 10

the ride, which was not required by the Standard.

921. On the material provided, which is scant, poorly recorded and entirely inadequate, there does not appear to have been any risk assessments of the operating procedures and the physical functioning of the TRRR and its controls other than by JAK. However, the scope, level of risk assessment and audit tools used by JAK are largely unknown, with no reference made to AS-3533.[1689] It does appear that the audits consisted of visual inspections of the rides with respect to safety and compliance. However, given that no design modifications were recommended in any year (such as comments on water depth, pump reliability, steel frames in the troughs, conveyor design, conveyor slat design/replacement, seat belt reliability), it can be confidently stated that a full risk assessment of the design and operation was not conducted by JAK. It was noted that JAK appear to have been the only external assessors to have considered the functioning of the controls, however, some of their recommendations were not acted upon.

922. The focus of Mr. Polley and DRA appear to have been on the maintenance and structural condition of the ride, and related management documentation, as dealt with in AS-3533 Parts 2 and 3, rather than on the design aspects as to the rides fitness for purpose and safety as a system when operating.[1690]

923. Mr. Rutherford noted that a 'visual' inspection of the external areas only (e.g. Main Operator control panel area) may *indicate* that an adequate set of safety features are in place as the 'Prevention of Start-Up' interlock switch was an approved switch intended for safety applications, and the *Emergency Stop* was the required RED/YELLOW colour. However, this will not reveal that the internal components used and interfaced to, as well as the configuration, provide an actual safety level. This can only be determined by a person with adequate knowledge of *Safety Related Control Circuits,* along with reference to up to date Circuit Diagrams and detailed CCL (Critical Component List), neither of which appear to be in existence for the TRRR at the time of the incident, other than in the case of the PFI 2016 modification.[1691]

(8) In light of the tragedy of this incident, are there any changes that could be made to the Australian standards or present regulatory system for Amusement Rides in Queensland, which may prevent a similar incident from happening in the future?

924. The suggested changes to the current regulatory system in Queensland to ensure a similar incident doesn't happen again, as recommended by the experts, are outlined below. I accept that those recommendations should be adopted.

925. It was recommended that Annual Risk assessments of amusement devices should be required to include detailed examination of the operation of the ride during all modes of operation and possible emergency conditions.[1692] The assessment should include all possible control system functions and variations and it is likely that it would require assessment by both competent mechanical and electrical engineers. At inquest, the importance of this detailed consideration of the device was said to be necessary given the complexity of the machine.[1693]

[1689] Ex I5, pg. 10
[1690] Ex I5, pg. 10
[1691] Ibid.
[1692] Ex I5, pg. 11
[1693] T30-44, lines 2-38

926. Furthermore, the section in the Australian Standards applicable to waterborne rides (including raft rides) needs to be reassessed to include some of the types of safety requirements associated with roller coasters, including more thorough considerations for lifts/elevators, collisions and passenger loading/unloading.[1694]

927. The requirement for hazard identification and risk assessment in AS-3533.2 section 5.1 should also be made mandatory. Any modification or alteration to the ride should require hazard identification and risk assessment to ensure that changes made do not affect safe operation and use.[1695]

928. Better direction to other relevant Australian Standards (e.g. the AS 4024 series) should also be provided. A requirement that hazard identification and risk assessment include consideration of failures that may affect safety.

929. Dr Gilmore is of the view that whilst the relevant Australian Standards and Regulations in place in Queensland are adequate, a tightening of the checking and enforcement process should take place, such as a requirement that full risk assessments and inspections are actually conducted and fully reported. It is also recommended that engineering, administrative and protective equipment controls are properly implemented, together with documentation of the history and maintenance.[1696] This could be performed by having the requirements independently certified annually by an RPEQ (or several RPEQ's), in a similar manner to the annual inspections for mechanical and structural adequacy, together with random spot checks of documentation by OIR. Mr. Rutherford noted that any such RPEQ involved must be able to demonstrate adequate knowledge and experience in the areas that they are reviewing.[1697] For example, an Electrical RPEQ does not necessarily have adequate knowledge in the area of *Safety Related Control Circuits*, as this is a specialist area.

930. At inquest, Dr Gilmore noted that whilst the Australian Standards have stipulated hazard identification requirements since 1997, this was not being carried out in relation to the TRRR, and unfortunately there were no regulatory checks to ensure it was being done.[1698]

931. Dr Grigg is of the view that seat belts with positive latching buckles, as found on aircraft lap seatbelts, should be required. Their mounting points should be located in the same position relative to the seat as that used in cars and aircraft.[1699]

932. Mr. Rutherford is of the view that there are adequate details and requirements in the current applicable Australian Standards with respect to *Safety Related Control Systems* and *Electrical Safety*, if these standards are followed correctly. However, he cites a lack of enforcement by the Regulators as an issue to be addressed.[1700]The enforcement by the Regulators in Australia varies on a State by State basis. In Mr. Rutherford's experience, OIR is currently the most pro-active Regulator in Australia in relation to Machinery Safety compliance, and has a culture of trying to educate not only the Amusement Ride Industry, but Industry

[1694] Ibid.
[1695] Ibid.
[1696] Ex I5, pg. 11
[1697] Ibid.
[1698] T30-45, lines 1-17
[1699] Ibid.
[1700] Ibid.

in general, as well as other State Regulators.[1701] One weakness in this approach is the lack of detailed knowledge on ***Safety Related Control Circuits*** held by the majority of OIR Inspectors. Mr. Rutherford is of the view that this must be addressed, in conjunction with mandatory requirements for up to date circuit and component documentation for all Plant safety features (not only Amusement Rides). There must also be support provided by OIR for Inspectors to issue ***Prohibition notices*** and the like on significant Plant.[1702]

(9) In your opinion, are there any other safety issues arising from this tragic event, which need to be considered and addressed in order to ensure a similar incident does not occur in the future? If so, what measures need to be undertaken?

933. The experts all agreed that having considered the circumstances of this tragic incident, the recognised absence of adequate documentation and engineering controls destroys the assumption that the annual ride inspection was a sufficient oversight mechanism (according to Regulations) for the public safety of the ride.[1703] The initiation of a formal document and control system for each ride should take place, which includes the appointment of a *designer* or *competent person* for every ride, registered with OIR, with tertiary qualifications in engineering and relevant experience.

934. Dr Gilmore recommended the use of an external party to be engaged to conduct independent risk assessments. The independent party must be a Registered Professional Engineer of Queensland (RPEQ). Dr Grigg questions the need for an independent RPEQ for annual assessments if the *competent person* is qualified.

935. It was further proposed that the Regulations should make clear the onus placed on a *competent person* (who may be an RPEQ) when conducting an annual inspection or a risk assessment, in order to provide support for time spent in conducting such a task thoroughly. These assessments should include the following:[1704]

i. The operation of the ride must be visually observed, with the 'what if's' asked and trial events conducted i.e. not a cursory inspection or tour.

ii. Low probability failures need to be actively considered. Suggestions that the ride has been trouble free for 30 years is not an acceptable excuse. History demonstrates that low probability coincidences often turn out to be the cause of a major unexpected incident. Examples abound in aircraft, train, motor vehicle, motor cycle and helicopter crashes, crane and elevating work platform collapses, and fires.

iii. Observe how the machine handles adverse events. Run trial days where pumps are shut down, water levels decreased (or increased), rafts bottle neck, impact each other, to highlight weaknesses and expose hidden features of the design.

[1701] Ibid.
[1702] Ibid.
[1703] Ex I5, pg. 12
[1704] Ex I5, pg. 12

iv. Consult Theme Park records internally and internationally.

v. Consider whether the machine was fool-proof, and if not what engineering controls could be possibly utilised.

vi. Look at design records.

936. During cross examination at the inquest, when asked about predicting low probability events, as this incident was characterised, Dr Grigg stated,[1705]

> *Dr Grigg:* *I can agree that low probability events can be difficult to predict, but I don't think for a minute that anyone doing a risk assessment on that ride would not observe things which could be regarded as anything other than hazards.*
>
> *Mr. Hodgkinson:* *Well, I will come back to that, but do I understand your evidence to be that the proposition you agree with, in relation to this ride, you draw some additional matters about the objectives foreseeability of the hazards?*
>
> *Dr Grigg:* *No, I think – it's a low probability event simply because it has operated for 30 years without anything happening. I think that's my interpretation of what Dr Gilmore is referring to, and it's a bit like, you know, somebody crossing the road: they've done it many times, but there's the risk that they're going to get knocked down by a car. It might be a low probability event, but you know that you – it's a hazard and you've got to do something about it if you're the individual crossing the road. And in this case, the patrons weren't in a position to do that, but the people running the ride should have appreciated that there was a risk there.*

937. When he asked about the inability of investigators to re-enact the tragic incident, Dr Gilmore stated:[1706]

> *The outcome of the – the unfortunate deaths of people might have been difficult to – to predict, but the – the coming together of rafts was not difficult to predict, and in fact, Dreamworld themselves had three – three prior incidents, in*

[1705] T30-56, lines 1-18
[1706] T30-59, lines 15-25

> *'04, '05 and '14, in which rafts came together and bumped, and they themselves shut down the conveyor because they required the – they thought that the situation had become undesirable and dangerous – and I think that's as far as you need go. If you identify a situation where two rafts come together, that's – that is a situation where you shut the conveyor down, and whatever happens after that – that – that may be more – more difficult to predict, but the – it can go any way from there, but – and, in – in this incidence, it went one particular way.*

938. Dr Gilmore further stated:[1707]

> *…I don't think it's actually relevant that the police were unable to exactly replicate the – the exact incident because the crux of - of the incident was that two rafts came together. After that, what actually happened – we know what happened – but it could've gone any one of many different ways.*
>
> *…*
>
> *The fact that the – it turned upside down and people fell into the conveyor, into the water, that's one way but another might've been people fell off the raft into the water. Who knows – might've happened then.*
>
> ..
>
> *It might've ended up happening but it may have ended up another way.*

939. It was also suggested that a requirement be introduced stipulating that a full risk assessment (according to Australian Standards) on the whole ride be conducted during commissioning, after major modifications and every 5 years.[1708] The annual inspection is an ideal time to report any new modifications or installations/equipment changes in the past year. The RPEQ, who performs the mechanical/structural inspection, or another independent *competent person* (preferably also an RPEQ), should be requested to include a review of written documentation and the ride, illustrating any recent modifications within the past year, including photographs, and present a recommendation as to whether a fresh risk assessment should be conducted immediately. The Proprietor must keep ongoing detailed written documentation of equipment maintenance and any modifications, which can be made available for spot checks by OIR. It would be expected that the RPEQ would be assisted by the *designated competent person* during these assessments.

940. With respect to annual inspections, given the report need not be submitted for a compliance check, it is recommended that spot checks by OIR be carried out to ensure proper conduct and thoroughness.[1709] Annual inspections should also include photos to identify if modifications have been made and if they have been

[1707] T30-150, lines 23-40
[1708] Ex I5, pg. 12
[1709] Ex I5, pg. 13

advised to WHS Queensland as required.

941. In relation to 'new designs', the experts suggested that these should be documented to reveal the design methodology, what was considered, safety considerations, with the log and register with OIR to be kept centrally.[1710] Further, testing of a ride must be carried out, and be comprehensive. It is difficult to nominate dynamic aspects which might be required for example to identify a problem hidden for 30 years. This has to be overcome by inquisitiveness and enthusiasm, which needs to be well documented.

942. Mr. Rutherford is of the view that OIR Inspectors (and any organisation or individual involved in this area) need to be more aware and knowledgeable on applicable *Safety Related Control Systems* and *Electrical Safety*. He also notes that it is important that documented Electrical Circuitry, Critical Component Lists etc. are updated as modifications occur. These are essential to the safe on-going maintenance of Plant.[1711]

Expert's Response to the Proposed Draft Regulations

943. Having heard the evidence of Mr. Bick in relation to the new safety case regime proposed in Queensland, the experts were asked to comment on the sufficiency of the amendments and new scheme.

944. In response, the following comments of note were made by the experts:

(i) Dr Gilmore and Dr Grigg agreed that the new Regulations needed to include a requirement that the owner of an amusement device comply with the updated Australian Standards.[1712]

(ii) Dr Gilmore endorsed the development of a Code of Practice for amusement devices as has been suggested by OIR.[1713]

(iii) Dr Gilmore endorsed the introduction of a safety system of management and the enforcement of such a requirement by the Regulator through active auditing and spot checks.[1714]

(iv) Mr. Rutherford noted that it was important that the new Regulations require the consideration of hidden components of an amusement device to ensure a detailed review is conducted.[1715]

Mr. Chan's Response to the Expert Evidence

945. Mr. Chan agreed with the suggestion made by Dr Gilmore as to the extension of the annual inspection requirements for the competent person engaged so as to include a risk assessment, as detailed above at [925]. Whilst he acknowledged that the current requirement for annual inspections does not expressly include a risk assessment, the obligation of the Engineer conducting the inspection to consider the hazards present would be beneficial.[1716] We would interpolate

[1710] Ibid.
[1711] Ibid.
[1712] T30-23, lines 32-45
[1713] T30-27, lines 28-38
[1714] T30-45, lines 30-40; T30-46, lines 1-25
[1715] T30-46, lines 27-48
[1716] T31-3, lines 5-45

'essential'.

946. With respect to the suggestion that a full risk assessment on the whole ride be undertaken after all major modifications and every five years, Mr. Chan stated that the proposed amendments to the Regulations included a requirement with respect to major inspections of amusement devices, at timeframes suggested by the manufacturer or a component, or 10 years.[1717] He questioned the validity of stipulating a general 5 year arbitrary timeframe, when this may not accord with the requirements of the manufacturer in relation to a particular component of the device (i.e. a shorter or longer period may be necessary).[1718]

947. Whilst Mr. Chan did not agree with a blanket requirement that amusement device owners should follow 'best practice' by updating a ride when any change was made to the applicable Australian Standard, he did agree that this would be appropriate for changes made to the Standards applicable to the maintenance and inspection of a device.[1719] I would agree that it becomes mandatory.

FURTHER EXPERT ADVICE

Human Factors Report on Fatal Incident, Professor Penelope Sanderson

948. During the course of the OIR investigation into the causes of this fatal incident, a Human Factors Report was sourced from Professor Penelope Sanderson, a Professor of Cognitive Engineering and Human Factors, School of Psychology, University of Queensland.[1720]

949. Professor Sanderson was requested to consider nine specific questions concerning the cognitive and other factors impacting Ride Operators in various situations with respect to the specific operation of the TRRR. The expert advice provided is outlined below.

(1) Given the ride's layout, controls and displays, what perceptual motor and cognitive skills should Operators have developed to carry out the ride's required tasks across a range of normal conditions?

950. In relation to a two person operation of the TRRR, Professor Sanderson notes that there are 22 signals to process and tasks to perform if Ride Express guests and children are present, and 17 signals if this is not the case.[1721] In addition, there are also around 21 background or periodic checks of the ride operation and engineering status for the Load Operator to carry out. Accordingly, there are a total of between 38 to 43 signals and checks that must be done.[1722]

951. Based on calculations and analysis conducted by Professor Sanderson of the TRRR cycle times, the following factors of a two person operation were noted:[1723]

(a) The 17-22 signals to notice and tasks to perform have to be completed in around 35 seconds during holiday periods and in around 43 seconds during non-holiday periods.

[1717] T31-5, lines 30-48
[1718] T31-5, lines 30-47
[1719] T31-6, 7, lines 1-25
[1720] Ex C2(5)
[1721] Ex C2(5), pg. 7
[1722] Ex C2(5), pg. 7
[1723] Ex C2(5), pg. 7 & 8

(b) For every one second of operation, therefore, an Operator should process approximately one signal or perform one task.

(c) In addition, for every one second of operation, an Operator should complete approximately one background or periodic check.

(d) This very high ratio of signals/tasks/checks to elapsed time would be difficult to achieve fully, and difficult to sustain fully.

(e) Given the operational constraints of the ride, including timing and buffering capacity, Operators are forced to prioritise activities that get rafts loaded and dispatched. Accordingly, they would need to develop ways to manage periodic and background checks either through incorporating them into 'rituals' where possible, performing them parallel to other activities, performing them only when there is unoccupied time during load activities or performing them less frequently then on every dispatch cycle.

(f) There was no explicit training for Operators on how to prioritize or manage what could become an overload of activities.

952. Professor Sanderson noted that given the Load Operator's primary task is to settle guests into rafts and have them dispatched, which already requires 17-22 steps, it is unlikely that all the 21 background and periodic checks could be done for each cycle.[1724] However, a failure to perform any one of those checks might be a factor which could contribute to an incident.

953. Professor Sanderson states that the design of the Main Control Panel at the TRRR does not translate the buffering capacity of the ride or the potential time for the Operator to process signals, complete tasks and perform periodic and background checks.[1725] That is, the design of the panel does not make the Load Operator 'smart' about how best to use the time available in the system.[1726] In addition, there are no cognitive aids provided in the form of readily visible checklists of periodic and background checks, which need to be performed.

(2) Given the ride's layout, controls and displays, what perceptual motor and cognitive skills should operators have developed to carry out the ride's required tasks in different kinds of emergency situations?

954. Professor Sanderson noted that in the TRRR manual, there was '*quite complex mapping of anticipated emergencies and operational problems'* to the actions that the Operator is expected to carry out.[1727] There are differences in the expected response depending on the type of emergency or operational issue, which includes whether the ride needed to be shut down or whether dispatch should be suspended, as well as whether a supervisor needed to be advised or not.[1728] Professor Sanderson noted that there was potential for Operators to be made 'smarter' in their response to anticipated emergencies by better information design and display, as well as better training and training evaluation processes, such as emergency drills or simulations.[1729]

[1724] Ex C2(5), pg. 9
[1725] Ex C2(5), pg. 10
[1726] Ex C2(5), pg. 10
[1727] Ex C2(5), pg. 12
[1728] Ex C2(5), pg. 12
[1729] Ex C2(5), pg. 12

955. In relation to classifiable emergencies, which are defined as a feasible emergency situation that the Operators and/or engineers recognise, Operators will need to be able to recognise the potential consequences of the emergency and apply to appropriate procedure.[1730]In order for this to occur, a general familiarity with the ride structure, functioning and risks will be necessary.

(3) Could operators be impaired from executing corrective action in an emergency situation?

956. Professor Sanderson notes that any operator of a system can be impaired from executing appropriate corrective action in an emergency situation, which can arise from a variety of sources, including stress.[1731] Stressful situations can narrow a person's attentional focus, and may prevent them from processing information, which seems peripherally less important.[1732] Several studies have shown that people under stress may be able to carry out highly familiar and well-practiced routines, however, will struggle carrying out novel or rarely used processes.[1733]

957. Professor Sanderson noted that from Mr. Nemeth's account, the approach of Raft 5 towards Raft 6, stranded on the support rails, was stressful and may have narrowed his attentional focus so he did not fully process the information Ms. Williams was asking him from the unload area.[1734] Furthermore, the stressful events coupled with the poor user interface design of the Main Control Panel, may have meant that Mr. Nemeth did not activate the conveyor stop button effectively.[1735]

958. In evidence during the inquest, Professor Sanderson stated that the stress associated with responding to the emergency situation, which presented on the day of the tragic incident, in addition to the regular Operator duties to be carried out, would have made it difficult to work out exactly what to do in the situation, particularly as there wasn't a procedure for exactly that situation.[1736]

(4) Could Operators' normal tasks/duties impact on their ability to observe and respond effectively to emergency situations in a timely manner?

959. Professor Sanderson notes that normal tasks and duties may delay or preclude Operators from either noticing or being able to respond effectively to operational problems or emergency situations, with the reverse also being the case.[1737]

960. Having considered the activity sequence specified in the Operator Procedure manual in the event of an operational problem requiring a shutdown, which has up to 11 steps, Professor Sanderson found that this may make it difficult for Operators to observe and respond to emergency situations, which occur in addition to operational problems, such as retrieving rafts, focusing on operating the Main Control Panel or observing guest behaviour.[1738]

961. In relation to operating problems, which require a shutdown, as noted in the

[1730] Ex C2(5), pg. 12
[1731] Ex C2(5), pg. 15
[1732] Ex C2(5), pg. 16
[1733] Ex C2(5), pg. 16
[1734] Ex C2(5), pg. 16 & 17
[1735] Ex C2(5), pg. 17
[1736] T31-19, lines 40-47
[1737] Ex C2(5), pg. 18
[1738] Ex C2(5), pg. 19

Operator Procedure Manual, Professor Sanderson noted the following:

- **Loss of power to one or both pumps**: This causes a drop in water level over a short period, which may be noticed relatively quickly by an Operator if they are loading a raft or manning the Main Operator control panel and noticed the pump amps drop. However, if the Operator was communicating with guests, these signals may be missed, thereby delaying the Operator's ability to observe and respond quickly to this operational problem.[1739]

- **Loss of power to the conveyor or chain break:** Normal activities could delay an Operator noticing that the conveyor wasn't operational, thereby delaying the response.

- **Raft stall at the bottom of the conveyor:** Unless the Operator was viewing the CCTV at the Main Control Panel, other operational tasks would delay their ability to observe this issue and respond accordingly.[1740]

- **Raft Jam:** How quickly an Operator responds to such a situation largely depends on where this happens around the watercourse and what the normal duties and tasks the Operator is engaged in at the time.[1741]

- **Raft slips on conveyor:** Whilst it was recognised that this failure was lessened by the recent installation of the sensors and jacks at the beginning of the conveyor, CCTV would be the only means such an event would be noticed, and it would depend on what other tasks the Operators were engaged in as to how quickly this issue was identified.[1742]

962. Professor Sanderson noted that with the TRRR, '*any situation where there is a risk of serious injury to Guests or Staff*' depending on its nature, may not be identified if the Operator is '*facing away from visible evidence of it, if attempted communication between operators does not succeed, or if ambient noise makes it impossible to hear any evidence of it*'.[1743]

963. In addition to emergencies, Professor Sanderson was of the view that normal tasks and duties of Operators would affect their ability to observe and respond effectively to operating problems, which may not require a shutdown of the ride.[1744]

964. Two types of emergencies were identified in the Operator Procedure Manual for the TRRR, namely; serious injury to a guest or staff member (3.6.1) and person in water and/or raft capsized (3.6.2). Per the requirements of the manual, an Operator needs to respond to an operational problem by interlacing three sets of activities, namely:[1745]

    a. Normal duties/tasks relating to guest management and answering guest questions, and performing background checks and periodic checks on system status.

[1739] Ex C2(5), pg. 19
[1740] Ex C2(5), pg. 20
[1741] Ex C2(5), pg. 20
[1742] Ex C2(5), pg. 20
[1743] Ex C2(5), pg. 20
[1744] Ex C2(5), pg. 21
[1745] Ex C2(5), pg. 22

b. Procedure associated with handling the operational problem.

c. Procedure associated with handling the emergency.

965. Professor Sanderson noted that when two or more activity sequences are interlaced, the likelihood of any one of them may be resumed or completed at an incorrect point is increased.[1746] Given the number of events to attend to in such a situation, the time required to complete each may be greater than that available to complete them in a safe manner.[1747]

(5) What factors might prevent or limit effective communication between Operators at the un-load and load stations?

966. Professor Sanderson noted that the following factors limited or prevented effective communication between Operators at the load and unload stations of the TRRR:

- Sight lines – there was 12 m between the two stations, with some structures creating obstacles between the two. There was no radio or telephone communication between the two points. Visual communication was the main potential means of communicating, which was difficult when the responsibilities of each Operator require them to have their back to one another.[1748]

- Noise: It was noted that ambient noise created by the functioning of the ride could jeopardise the Operator's ability to successfully attract the attention of the other through vocal communication.[1749] Various noise was evident from the operation of the ride and includes the sound of the dispatch alarm, the conveyor, the rapids, guest conversations and other nearby attractions (for example, the Buzzsaw).

- Reflections on the glass of the Load station workstation

967. Given the above ambient sounds present at the TRRR whilst it was in operation, it would have made it difficult for the unload and Load Operators to attract each other's attention and to sustain a conversation, which would make it more challenging to respond to an emergency.[1750]

(6)(a) Did the training provided to Operators enable them (on the day) to respond effectively to emergency situations in a safe and timely manner?

968. Professor Sanderson recognised that it was impossible to write procedures and to train staff in all emergency situations. However, training is not a '*reliable way to compensate for poor design in the way the engineering constraints and possibilities for operation action have been conveyed to the operator through the user interface'*.[1751]

969. Having considered the circumstances of the incident on 25 October 2016, and the response by both Mr. Nemeth and Ms. Williams in the context of the Operator

[1746] Ex C2(5), pg. 23
[1747] Ex C2(5), pg. 22
[1748] Ex C2(5), pg. 24
[1749] Ex C2(5), pg. 24 & 25
[1750] Ex C2(5), pg. 26
[1751] Ex C2(5), pg. 27

Procedural Manual and associated supplementary memorandums, Professor Sanderson noted that:[1752]

- The manual does not specify the timeframe by which a shutdown needs to be performed in the event of a pump failure; and

- It is unclear what kind of training would be adequate to ensure reliably rapid and highly accurate responding to the unanticipated emergency as transpired during the tragic incident.

(6)(b) Would periodic and scenario-based emergency drills improve Operators' ability to respond to actual emergency situations?

970. Professor Sanderson noted that emergency drills provide an opportunity to develop procedural knowledge, rather than a purely operative level of declarative knowledge through simply reading procedures or hearing them described.[1753] Drills can help Operators reduce the impact of stressors on their performance and provide experience at solving the problems presented under less stress than in an actual emergency, which provides procedural knowledge. However, for an Operator to obtain the ability to respond to different kinds of actual emergencies, drills need to cover a range of emergencies, including anticipated emergencies, classifiable emergencies and multiple-event emergencies.

971. Professor Sanderson notes that an important component in any kind of drill is the after-action replay and the after-action debriefing.[1754]

(7) Are user interface principles applicable to the design of each control board? Could the design and layout of the control boards contribute to errors?

972. Professor Sanderson notes that user interface principles are applicable to the design and layout of any device or system with which people interact. This is especially so when the system is physically large or involves a hazard, in which case *'the user interface must bring relevant information to the operator, display it in a way that the operator will understand, and provide appropriate controls whose functioning the operator will understand'.*[1755]

973. Professor Sanderson found that from viewing the video walkthroughs, Operators had different mental models of some system functioning and procedures, as well as different ways of enacting procedures.[1756] Examples include:

- Order of performing the emergency sequence.

- Whether the E-Stop at the unload station stopped the conveyor or the conveyor and the North pump.

- How long the operator should hold down the conveyor stop button on the Main Control Panel for it to activate.

974. Professor Sanderson also noted that the Operator Procedures for the ride use

[1752] Ex C2(5), pg. 29
[1753] Ex C2(5), pg. 30
[1754] Ex C2(5), pg. 31
[1755] Ex C2(5), pg. 32
[1756] Ex C2(5), pg. 32

text only, with no schematics, pictures or diagrams. The procedures therefore are possibly not as effective as they could be for all learning styles.[1757]

(8) Could individual, situational and environmental factors contribute to the way Operators implemented procedures?

975. Professor Sanderson found that individual, situational and environmental factors could contribute to the way Operator's implemented procedures both in general and around the time of the incident.[1758] In general, situational and environment factors have a more systematic influence on how Operators implement procedures.

976. It was noted that in relation to the TRRR, there was some differences, which emerge as to the Operator Procedure manual descriptions of procedures and how Operators implemented those procedures.[1759]

977. In relation to the tragic incident, it is unclear whether and when the technical part of the shutdown sequence of the ride was initiated at the Load station, and if initiated, when it was completed. If the procedure was not completed in the 54 second interval between Raft 1 being grounded and Raft 2 colliding with it, factors needed to be considered as to why this may occur with an experienced Operator.[1760] It is possible that the sequence was interrupted by other tasks necessary to perform, or there was sequence confusion.[1761]

(9) Did the operators' normal duties/tasks (and degree of training) have any impact on their ability to observe and respond to the emergency situation?

978. Professor Sanderson was of the view that when the Operator's execution of normal Code 6 duties at the Load station is combined with the communications difficulties and the unanticipated nature of the emergency, there is a strong case that the combination of factors would have reduced the Operator's ability to observe and respond to the emergency.[1762]

Expert Report by Principal Naval Architect, Mr. Mark Devereaux

979. At the request of OIR, Principal Naval Architect, Maritime Safety Queensland, Mr. Mark Devereaux considered the floatation and stability characteristics of the rafts used on the TRRR.[1763]

980. Mr. Devereaux, having considered the CCTV footage, relevant photographs, the physical rafts and other relevant brief material, as well as the design aspects of the ride, he concluded that the floatation or buoyancy aspects of the design or construction of the rafts were not significant contributing factors in the tragic incident.[1764] Assuming the rafts are regularly drained of any trapped water and the tube channels are kept inflated, he found that the rafts had adequate stability for operation in the TRRR. Mr. Devereaux notes that if the raft tubes are kept properly inflated, they have adequate stability for their intended purpose, '*as it is*

[1757] Ex C2(5), pg. 34
[1758] Ex C2(5), pg. 35
[1759] Ex C2(5), pg. 36
[1760] Ex C2(5), pg. 37
[1761] Ex C2(5), pg. 39
[1762] Ex C2(5), pg. 42
[1763] Ex B4(2)
[1764] Ex B4(2), pg. 11

the volume of the inflated tubes that provides the significant majority of the buoyancy and stability of the rafts'.[1765]

981. Having considered the tragic incident, Mr. Devereaux further noted that there was a critical rate at which water needed to be pumped into the TRRR, to maintain adequate height of the water above the steel supporting rails to allow rafts to remain buoyant and not become stranded.[1766]

Dreamworld Ride Velcro Seatbelt Test, APV Engineering & Testing Service, Mr. Jose de Freitas

982. During the course of the OIR investigation, APV Engineering and Testing Services were requested to conduct static testing as to the performance and reliability of the Velcro Seatbelts in used on the TRRR at the time of the fatal incident. A report outlining the findings of this testing was prepared by Test Engineer, Mr. Jose de Freitas.[1767]

983. The testing conducted found that the performance of the Velcro Seatbelts can vary significantly, depending on various factors, which are often not apparent and can be difficult to control.[1768] The belt strap overlap, condition and the applied pressure during the belt strap engagement were found to be the three major factors that affected the performance.

984. It was recommended that, for the purpose of the Dreamworld ride application considered (TRRR), an industrial seatbelt in accordance with SAE J386, along with an automatic lock retractor ought to have been used.[1769]

[1765] Ex B4(2), pg. 9
[1766] Ex B4(2), pg. 11
[1767] Ex F18
[1768] Ex F18, pg. 38
[1769] Ex F18, pg. 40

ANALYSIS OF THE CORONIAL ISSUES

The Findings required by s.45 of the *Coroners Act 2003*

985. In accordance with s.45 of the *Coroners Act 2003* ('the Act'), a Coroner who is investigating a suspected death must, if possible, make certain findings.

986. On the basis of the evidence presented at the inquest, I make the following findings pursuant to s.45:

a. The identities of the deceased persons are Kate Louise Goodchild, Luke Johnathan Dorsett, Cindy Toni Low and Roozbeh Araghi.

b. At around 2:05 pm on 25 October 2016, the deceased, whilst traveling on Raft 5 of the Thunder River Rapids Ride at Dreamworld Theme Park, collided with a raft stranded on the steel support railings at the unload area shortly after exiting the conveyor. This collision caused Raft 5 to be lifted and pulled vertically into the mechanism of the conveyor. Two other occupants of Raft 5 managed to escape, however, the deceased were caught in the mechanism of the ride, and were either ejected into the water beneath the conveyor or trapped in the raft.

c. The date of the death of all of the deceased persons was 25 October 2016.

d. The place of death for all of the deceased was the Dreamworld Theme Park, 1 Dreamworld Parkway, Coomera on the Gold Coast.

e. The cause of death for all of the deceased was as a result of the combined effect of severe internal and external injuries as a result of multiple compressive impacts.

987. Comments as to the specific issues identified and considered during the course of the inquest hearing are outlined below. I find as follows:

Examination of the Thunder River Rapids Ride at the Dreamworld Theme Park, including but not limited to, the construction, maintenance, safety measures, staffing, history and modifications.

988. It is clear from the expert evidence that at the time of the incident, the design and construction of the TRRR at the conveyor and unload area posed a significant risk to the health and safety of patrons. The hazards associated with configuration of the ride identified by the experts and investigators were significant, and included the wide spacing of the slats of the conveyor, the nip point at the head of the conveyor and the steel support railing, the effect of a pump failure on the water level and the absence of the emergency stop button for the conveyor at the Main Control Panel. Each of these obvious hazards posed a risk to the safety of patrons on the ride, and would have been easily identifiable to a competent person had one ever been commissioned to conduct a risk and hazard assessment of the ride.

989. The experts engaged for the purpose of this coronial inquest and by OIR to investigate the cause and circumstances of the tragic incident reached their opinions independently and were all in basic agreement as to the combination of causes. They were highly qualified to do so, based on the evidence presented, and were not influenced by so-called "hindsight bias" in reaching their conclusions. There was ample evidence of the potential for disaster of this nature occurring, based on the evidence before them, and had notice been taken of and lessons learned from, the preceding incidents that were all of a very similar nature, and of which there was ample photographic evidence and reports prepared. It is indeed very fortunate, to quote Mr. Tan, that no lives were lost in those earlier incidents.

990. Whilst it appears from the records provided that the initial design of the TRRR was approved by the Chief Inspector of Machinery in 1987, there were multiple significant modifications made to the ride prior to the incident in 2016. The records available with respect to these modifications are scant and ad hoc, and establish that for the duration of the rides commission, it was modified essentially without a 'designer'. It does not appear that anyone external or internal to Dreamworld, including Mr. Tan, were ever formally charged with conducting a holistic engineering risk and hazard assessment of the ride, despite the major modifications and changes made during its tenure. The modifications made to the ride, despite being significant, were also never reported to the Regulator. It can be accepted, as was the evidence of the experts that these alterations would have amounted to a new design and should have been registered by Dreamworld with the Regulator. A failure to record modifications, a lack of 'designer' input and a lack of reporting to the Regulator have contributed to the masking of the real risk of the TRRR.

991. From the limited documentary information available, it appears that the modifications made to the TRRR were somewhat random, seemingly in response to specific acute issues, without any consideration given as to the other risks or hazards that may be created as a result of the change. There was no proper engineering oversight of the ride, changes made or consideration of past incidents for which engineering solutions should have been implemented. Accordingly, it can be accepted, as was found by the experts, that whilst there were various occasions for which s.5.1 of the AS3522.2-1997 should have been triggered, and a mechanical hazard identification and risk assessment of the ride undertaken, this was never done. Unfortunately, there were clearly a number of missed opportunities during which Dreamworld could and should have identified the safety issues associated with the ride.

992. The maintenance tasks undertaken on the ride, whilst done so regularly and diligently by the staff charged with such a responsibility, seem to have been based upon historical checklists, which were rarely reviewed, despite the age of the device or changes to the applicable Australian Standards, particularly 3533 Part 2 and 3.

993. The external auditing undertaken by JAK was not done so by way of reference to the Australian Standard, and, as was acknowledged and known by Dreamworld, focused on superficial aspects of the ride, rather than the engineering, design and safety aspects. This shortcoming is blatantly obvious from the reports provided by JAK, and was also raised by Mr. Randall once DRA were engaged by Dreamworld in 2013. I am satisfied that Dreamworld knew of this significant limitation with respect to the safety auditing being conducted on its devices, however, failed to take any steps to rectify it.

994. Previous incidents on the TRRR, particularly in 2001 and 2014, should have alerted Dreamworld to the hazards present on the ride, particularly the collision of rafts on the watercourse. These incidents should have prompted a thorough risk and hazard assessment of the ride, including the design, looking beyond the circumstances of the particular incident. In accordance with the hierarchy of controls, plant and engineering measures should have been considered as solutions to identified hazards. Whilst administrative controls are the lowest in the hierarchy, they nonetheless may be sufficient to manage some risks. However, for such a decision to be made, risks actually have to be identified and properly qualified consideration given as to the best solution to manage that risk. The risks and hazards posed by the TRRR, which have been highlighted by this incident and the experts, were never identified by Dreamworld as such assessments were never undertaken. A heavy and unreasonable reliance on administrative controls to ensure the safety of patrons on the TRRR was clearly not a reasoned decision following a proper risk assessment. Rather, it was simply a continuation of processes and procedures that had always been followed, during which there had not been a previous serious incident. This reliance by Dreamworld on the operation history of the ride as to whether a risk or hazard was present is clearly unsound and dangerous. The various high and low probability hazards and risks associated with the ride, which have been highlighted by the experts, were present and should have been identified by a suitably qualified risk assessor.

995. Rafts coming together on the TRRR was a well-known risk, highlighted by the incident in 2001 and again in 2004. During the investigation into the 2004 incident, it was acknowledged that various corrective actions could be undertaken to 'adequately control the risk of raft collision', however, a number of these suggestions, including a conveyor speed controller or raft positioners, were not implemented by Dreamworld. The Report into this incident acknowledged that at the time, the primary means of avoiding raft collision at the unload area was through administrative controls by Ride Operators. Whilst some engineering and automation modifications were made to the ride post this incident, it is clear that this primary reliance continued. Clearly, the combination of these controls at the TRRR was not sufficient to ensure that rafts were not able to come into contact with one another near the unload area. The knowledge that rafts could flip if they came together on the watercourse, particularly at the end of the conveyor near the unload area, was recognised throughout the history of the ride, including most recently in 2014. This risk and the peril posed to patrons of rafts colliding and possibly flipping was further highlighted by Mr. Tan in his email to the Leadership Team, where he outlined the events in 2001, stating, *'I shudder when I think if there had been guests on the rafts…'* Indeed this was recognised during Ms. Crisp's training of Ms. Williams where she claims she made a point of highlighting that two rafts could not be dispatched together or else there was a risk of capsize. Clearly, the risks associated with rafts colliding was known to Dreamworld.

996. Whilst the exact scenario that occurred in this instance may not have been able to be replicated during testing by Investigators, this is of limited relevance, and does not render the identification of the risk present unpredictable without the benefit of hindsight. The hazards and risks, which caused the rafts to collide at various points on the ride, and in particular at the end of the conveyor, were present and known, and should have been identified by someone qualified to conduct a risk and hazard assessment. Unfortunately, Dreamworld never engaged such a person and as such these risks were never mitigated.

997. It was agreed by the experts, and became obvious during the inquest hearing, that best practice for the TRRR was not followed by Dreamworld, particularly in relation to compliance with introduced Australian Standards designed to ensure the safety of devices. Whether these requirements are mandatory or not is largely irrelevant. Those Standards are the minimum practice that is required. It is the responsibility of those that own and operate high risk plant to ensure that the most up to date safety standards, risks and requirements known to the industry are considered and instituted if possible, to ensure the safety of staff and patrons. This was certainly not the case in relation to the conduct of Dreamworld as to the management, modification and maintenance of the TRRR. Dr Gilmore stated during the expert conclave that should 'best practice' not be followed with respect to safety standards, an owner would do so at their own peril. Unfortunately, this failure by Dreamworld to adequately ensure the safety of the ride and manage the obvious hazards and risks present was done so at the peril of Ms. Goodchild, Mr. Dorsett, Ms. Low and Mr. Araghi.

998. Given the nature of fixed amusement devices, it is reasonable for the community to expect that the owner and operator would ensure that there is no risk to the safety of patrons. Owners should be risk averse, which includes considering and identifying low probability failures for their devices, so that these risks can be mitigated altogether. Whilst it is accepted that there is always an inherent risk to safety given the nature of an amusement ride, it is expected, and is indeed reasonable to do so, that all action has been taken by the owner to eliminate the risks posed. That was not the case with respect to the TRRR. There is no evidence that Dreamworld ever conducted a proper engineering risk assessment of the ride in its 30 years of commission. The risks and hazards, which have now been highlighted by the experts, were never identified and considered by Dreamworld because such an assessment was never undertaken.

999. Dreamworld placed a great deal of reliance on Mr. Tan's engineering 'expertise' to ensure the safety of the amusement devices at the Park. Mr. Tan was not an RPEQ, which should have been known by Dreamworld, and was involved in a number of Special Projects within the Park. Sole reliance on him to undertake such an assessment on all of the devices at Dreamworld during his tenure was dangerous, given the level of responsibility associated with such an undertaking and his other responsibilities, including oversight of the E&T Department. Mr. Tan was, until Mr. Cruz was employed shortly before the incident, the only qualified engineer engaged by the Theme Park. It is obvious from the response provided by Ardent Leisure to OIR when asked about compliance with s.241 of the Regulations, that Mr. Tan's experience was a central tenant of the safety program in place at Dreamworld. For Australia's largest Theme Park that approach was irresponsibly and dangerously inadequate, particularly given the lack of succession planning in place following Mr. Tan's departure in January 2016.

1000. It is surprising, however, that Mr. Tan did not ever recognise the risk and hazards present on the TRRR from a design perspective, despite being consulted on various modifications made throughout its commission. Given his formal qualifications, experience and knowledge of the device, this seems like a missed opportunity, although it is accepted that Mr. Tan's role did not extend to considering the design of the ride.

1001. In addition to Mr. Tan, it seems that Dreamworld placed significant reliance on E&T staff and Ride Operators to identify risks and issues associated with rides. Whilst there can be no suggestion that these staff did not perform the roles they were given with dedication and in accordance with their training, it is unfathomable that this serious and important task fell to staff, who did not have the requisite qualifications or skillset to identify such hazards. Whilst the information and feedback from staff, who work with and on rides, is always valuable, it cannot and should not be the solitary means by which such hazards and risks are identified.

1002. Irresponsibly, and consequently tragically, the Safety Department at Dreamworld was not structured to operate effectively, with the safety systems in place at the time of the incident correctly described as 'immature'. Document management was poor, with no formal risk register in place, members of the Department did not conduct any holistic risk assessments of rides with the general view being that the E&T Department were responsible for such matters. There were no safety audits conducted as to the human components of the ride systems at Dreamworld. Furthermore, members of the Safety Department were not involved in the drafting of Operating Procedures for the amusement rides, a responsibility left solely with the Operations Department. It seems clear that there was a significant segmentation of knowledge between the Departments, which was further exacerbated by a poor record and document management system, making information difficult to obtain and access. It is important to note that evidence suggests that members of the E&T Department were only involved in developing and implementing controls for a potential hazard once it had been brought to the Department's attention.

1003. The resounding message of the General Managers responsible for the Departments at Dreamworld was that, as such risks and hazards had never been identified to them, they were unaware and therefore unable to take any action. Given no steps were ever taken to properly identify these risks by qualified people, it is unsurprising that such issues were not raised with management. This general ignorance of proper safety and adequate assessments was a recurring theme throughout Dreamworld in many of the Departments and reflects a systemic failure to ensure the safety of patrons and staff by the use of a proper safety management system, with the necessary engineering oversight of high risk plant.

1004. From the accounts provided during the course of the investigation and inquest hearing, it is evident that only a scant amount of knowledge was held by those in management positions at Dreamworld, including Mr. Deaves, as the General Manager of Engineering, as to the design, modifications and past notable incidents on the TRRR.

1005. It can be concluded beyond doubt that in the 30 years prior to this tragedy, Dreamworld failed to undertake, either internally or via an external auditor, a holistic examination of the TRRR by a suitably qualified engineer, so as to ensure its safe operation through the identification of the high and low probability risks and hazards present.

1006. During the inquest, Maintenance Planner, Mr. Naumann agreed that there had been a 'total failure' by everybody at Dreamworld to identify the safety issues in respect of the TRRR, which he acknowledged was completely unsafe at the time

the tragic incident occurred.[1770] This failure is supported by the evidence obtained and presented during the course of the coronial inquiry. Dreamworld has a reputation as a modern and world-class Theme Park. However, the safety, maintenance and operating systems in use to ensure guests safety were rudimentary at best, with Departments operating in silos, an absence of risk management and informal and ad hoc record keeping. The manner in which the documentation was provided during the course of the coronial inquiry and inquest further demonstrates the frighteningly unsophisticated 'systems' in place at Dreamworld intended to ensure the safety of patrons and staff. It is surprising, given the state of the safety management systems in place at Dreamworld that a tragedy of this nature had not occurred before now. It was simply a matter of time. That time came on 25 October 2016.

Records

1007. Records as to the design and manufacture of the TRRR are sparse. There is limited context as to the creation of the ride, how certain components were designed and commissioned, and the intended ongoing management and maintenance. It is unfortunate that this poor recording keeping continued throughout the 30 years of its commission, with respect to all aspects of the ride. Whilst voluminous records and documents were produced by Ardent Leisure following this tragic incident, and throughout the coronial investigation and inquest, they were arbitrary in nature and lacked context and explanation. This has made the task of piecing together the history of the ride, the modifications made, and the repairs and maintenance conducted, incredibly difficult for all parties. It becomes a more critical issue as a ride ages, because the demands for maintenance, and even replacement, will increase.

1008. What is clear from the records produced, and the difficulties Ardent Leisure had locating the requested information, is that the record keeping, document management and interdepartmental communication at Dreamworld was dire. It appears that the maintenance, inspection and repair action taken in relation to a ride was reactionary to issues arbitrarily or accidentally identified, rather than a proactive systematic approach following an independent, thorough assessment of a ride.

1009. The records and document control in place at Dreamworld, including for the rides, safety systems, maintenance and training of staff, was clearly significantly lacking, with only limited information available. Whilst Mr. Cruz was in the process of undertaking 'data mining compliance' with respect to the amusement devices at the time of the incident, this was clearly a difficult process that exposed the widespread lack of record keeping and document management that had been in place at Dreamworld for the past 30 years.

1010. It was recognised by Mr. Deaves that there were no records kept, which were easily accessible or centrally located, whereby staff responsible for the safety of the rides, both from an operations and engineering perspective, could examine and consider previous issues associated with a device. This absence of effective and complete record keeping essentially precluded any staff from being in a position to be able to appropriately and adequately assess and manage the risks, which may be present, particularly for rides like the TRRR. It is significant that the General Manager of Engineering had no knowledge of past incidents involving rafts coming together on the TRRR. It is clear that this lack of

[1770] T11-90, lines 25-47

knowledge essentially precluded him, and anyone else, from assessing or determining risks associated with the TRRR from an engineering perspective, which contributed to the environment in which such a tragic incident could transpire. I find that shoddy record keeping was a significant contributor to this incident.

The circumstances and cause of the fatal incident on the Thunder River Rapids Ride at the Dreamworld Theme Park, which occurred on 25 October 2016.

Technical Circumstances

1011. The technical cause and sequence of the tragic incident has been expertly considered and addressed in detail in the evidence as provided by the expert engineers, Senior Constable Cornish and the OIR Inspectors. I am satisfied that the incident occurred as previously outlined.

1012. It is clear that the primary cause of this tragic incident was the failure of the south pump, leading to a sudden drop in water level, following which the conveyor was not stopped. Dreamworld were aware that when one pump failed on the TRRR, the ride was no longer able to operate, with the water level dropping dramatically stranding the rafts on the steel support railings around the trough. Regardless, there was no formal means by which to monitor the water level of the ride, or audible alarm to advise one of the pumps had ceased to operate. Rather, a light on the Main Control Panel or ampere reading was all that notified an Operator of the pump failure, aside from the recognition that the water appeared to have fallen below a historical scum mark in the trough. Despite the significance of the water level to the safe operation of the ride, there was no automated safety system in place to monitor the water level or provide any audible or visual alert should it fall below a safe level.

1013. It was a second, major contributing factor of the incident that the conveyor continued to operate in the event of a pump failure. It remains unknown, and impossible to understand why, the two major components of the ride were controlled independently of each other. It is also unknown as to why there was such an arbitrary gap between the end of the conveyor and the steel support railings, which created a nip point of sufficient size for Raft 5 to be pulled into during the incident. When contact occurred between Raft 5 and the raft stranded on the steel support railing, it became forcibly engaged by the conveyor, due to the slat removal, entering that gap as it continued to impact the other raft, which was snagged on the steel support railing. It was the view of the experts, and which I accept, that had any one of the contributory factors been absent, the incident, as it transpired, would not have occurred. That being the case, given the multiple other hazards evident on the ride as was highlighted by the experts, this would not have precluded another catastrophic incident from occurring in another way.

1014. While the TRRR had operated fatality free for around 30 years, at the time of the fatal incident, it is clear that the design and construction of the conveyor/unload area posed a significant unidentified risk to the health and safety of patrons. A properly documented history with appropriate risk assessments, in all likelihood, would have identified and eliminated the serious risks.

Lack of Automation

1015. During the inquest, Senior Constable Cornish described the TRRR as 'severely' lacking in any type of automation, which was readily available. This was clearly accurate, and a sentiment shared by the engineering experts. It is unknown as to why basic engineering controls, such as a water level monitor or an interlock shutdown function for the conveyor in the event of a pump failure, was not installed on the ride. It is clear from Mr. Rutherford's evidence that a basic automated detection system for the water level would have been inexpensive and may have prevented the incident from occurring.

1016. The lack of a single emergency stop on the ride, which was capable of initiating a complete shutdown of all of the mechanisms, was also inadequate. Whilst JAK had recommended that a simpler automatic process be considered, and the Operations Department had sought input from the E&T Department as to a one button shutdown, it is unfortunate that no further action or follow up was undertaken. It is not clear as to why such a recommendation was not actioned and the risk deemed by Dreamworld to be 'acceptable'. It seems this lack of an emergency stop button for the conveyor at the Main Control Panel was contrary to the Australian Standards.

Operators Account of the Incident

1017. It is apparent that at the time of the tragic incident, Mr. Nemeth held the role of the No.1 Operator and was stationed at the Main Control Panel. He had primary responsibility for the operation of the TRRR. Ms. Williams, as the No. 2 Operator, was stationed at the unload area. There were no other Dreamworld employees in the area at the time.

1018. From the CCTV footage, and Mr. Nemeth's statement, it appears that it only took around 20 seconds from when the water level started to drop following failure of the south pump, before Raft 6 became stalled in the unload area on the steel support rails. The water dropped dramatically causing the ride to be unable to operate. A further 55 seconds passed, during which time Raft 5 travelled the conveyor and impacted with Raft 6. Statements from the occupants of Raft 6, as well as those, which were being loaded at the time of the incident by Mr. Nemeth, provide contradictory accounts of the sequence of events during the critical seconds before the tragic impact.

1019. It is evident from the CCTV footage that at the time of the incident, Mr. Nemeth remained at the Main Control Panel. Having noticed that the water level had dropped significantly, Mr. Nemeth advised the guests he had loaded that they would need to disembark. It is not clear when he initiated the shutdown sequence of the ride, particularly whether this was before or after the rafts collided and/or he had contacted the control room. There is no way to ascertain with any certainly as to whether he did and if so precisely when Mr. Nemeth may have pressed the conveyor stop button. He claims he pressed it multiple times but nothing happened. Testing following the incident by investigators found no issue with the operation of that particular control button. From the CCTV footage, the conveyor can be seen to commence a slow stop approximately 11 seconds after the rafts have collided. It seems in all likelihood, given the events that followed, that Mr. Nemeth may not have pressed the conveyor stop button until the rafts had collided or moments beforehand.

1020. During this time, Ms. Williams recalls, and can be seen on the CCTV footage, to remain at the unload station. She did not press the E-Stop button at that platform for a number of reasons, including the fact that the No. 1 Operator was not incapacitated, and as such retained overall control of the ride, including the shutdown procedure. She was also unaware that it stopped the conveyor.

1021. Given the traumatic events that were unfolding, and the multiple tasks being performed by both Ride Operators, it is understandable that there are discrepancies in the recollections provided by Mr. Nemeth and Ms. Williams as to the exact sequence of events prior to the tragic incident. As Ms. Williams had only been trained that morning, her recollection and knowledge of the Operating Procedures for the ride are understandably limited, and based on what she could remember from her 1 ½ hours training with Ms. Crisp.

1022. The stress associated with operating the TRRR, let alone responding to an emergency situation, was highlighted by Professor Sanderson. It is clear that the 38 signals and checks to be undertaken by the Ride Operators was excessive, particularly given the failure to carry out any one could potentially be a factor, which would contribute to a serious incident. There was no training provided to Ride Operators or Ride Instructors as to how tasks should be prioritised, with further hindrance provided by the poor user interface design of the Main Control Panel. The stress associated with responding to an emergency situation, which presented on the day of the tragic incident, in addition to the regular Ride Operator duties to be carried out, would have made it difficult to determine what should be done and in what order.

1023. Whilst it has been suggested by other staff, including some Supervisors, that Ms. Williams should have pressed the E-Stop button at the Unload platform in the circumstances that transpired on that tragic day, this simply does not accord with the training she was provided that morning, the clear requirements of the Operating Procedure Manual for the No. 2 Operator, nor the plain reading of the Memorandum issued on 18 October 2016. Mr. Nemeth was not incapacitated nor did he direct her to activate the E-stop. Rather he was standing at the Main Control Panel, and as the No. 1 Operator, had primary responsibility for the operation of the ride, which included the shutdown in a Code 6 situation. In these circumstances, the fact that Ms. Williams did not press the E-Stop button, which was unlabelled, is unsurprising. In addition, I have already referred to the negative wording of the memorandum produced regarding the pressing of the stop button. Had this been a positive direction to the No. 2 Operator to press the stop button in the circumstances, the tragedy may have been averted.

1024. It is clear that the safe operation of the TRRR primarily relied upon administrative controls, which required the Ride Operators to have an understanding and ability to observe and respond to situations, including emergencies, as and when they arise, including monitoring the water level, load and unload guests onto and off rafts and to monitor guests movements. This lack of engineering controls on a ride of this nature is unjustifiable.

Operator Responsibilities

1025. The responsibilities and substantial tasks placed on the Ride Operators at the TRRR, particularly the No.1 Operator who had primary responsibility for the operation of the ride and a supervisory role over the No. 2 and 3 Operators, were clearly unreasonable and excessive. The TRRR was commonly recognised as

one of the more complex rides to operate at Dreamworld, largely due to the manual elements, monitoring requirements and lack of automated controls. The Main Control Panel was complex, confusing and lacked the required labelling.

1026. Operating Procedures for the rides at Dreamworld were drafted by members of the Operations Department, with minimal input from E&T Department staff or Safety Department. They were supplemented by Memorandums, which were drafted by unknown authors. Those prepared for the TRRR, particularly with respect to the use of the E-Stop at the Unload area, were ambiguous and poorly worded, with relevant terms often left undefined. The expectation that a Ride Operator would be able to become familiar with a detailed Operating Procedure and the supplementary material, which sometimes conflicted, is wrong and poor practice.

Response to the South Pump 'Earth Fault'

1027. In the seven days prior to the fatal incident, there were five breakdowns of the TRRR, which were attributed to a failure of the south pump due to an 'Earth fault'. On each occasion, the drive was reset without any diagnosis of the cause or further investigation being conducted. Whilst Mr. Ritchie concluded that such a fault was no more than an inconvenient and intermittent issue, it seems clear that steps should have been taken to investigate the cause of the fault before the ride was allowed to continue to operate. The fact that the fault caused the pump to fail, rendering the ride inoperable, should have been sufficient to shut down the ride until a deeper investigation had been conducted. Mr. Ritchie's logic as to the risk posed to guests or Ride Operator's safety by the fault is unsound, as was the decision to allow the ride to continue to operate pending the inspection by Applied Electro.

1028. From the various accounts provided by members of the E&T Department, there was clearly confusion as to how the Breakdown Policy was to be applied, and whether a fault needed to occur two or three times before the matter was escalated to a Supervisor. This clearly played a part in the fatal incident, given it was the third breakdown of the ride that day. Furthermore, in relation to ascertaining what may constitute *'immediate danger'* for a particular ride, including the TRRR, there was no specific training provided to staff nor any guidance outlined in the procedure. During the inquest, evidence was given that E&T staff were not provided with training as to any particular risks or dangers, which might be present for a ride, or any particular component of a ride.

1029. Upon any reading of the requirements of the Breakdown Procedure, it seems evident that the practice of resetting the drive for the South Pump following an 'Earth Fault', given the nature of the component and the recurring breakdowns over the previous seven days, two of which occurred in close proximity of the same day, was in contravention of the Procedure. It does not appear that the Procedure was adhered to 25 October 2016 at the TRRR. Mr. Ritchie in his evidence agreed that there had been a significant breakdown of the procedure leading up to the incident.

1030. The various elements and components of this tragic incident, clearly demonstrate a systemic failure by Dreamworld, in relation to all aspects of safety, to ensure that the amusement rides open to the public were safe, well maintained and designed to minimise the risk they posed to patrons and the staff. It is unimaginable for the life of the TRRR that a failure of a pump and the

consequential drop in water level created immediately a known potential risk to patrons. Why safety action was not taken earlier that day I find very difficult to understand.

Examination of the sufficiency of the training provided to staff in operating the Thunder River Rapids Ride.

1031. The manner in which new Ride Operators were trained, that is by unqualified Senior Ride Instructors, had been in place at Dreamworld for many years prior to the tragic incident. The time taken to train a Ride Operator seemed to be dependent on the level of complexity and responsibility associated with the ride, and at most, extended to a day on-site training with follow up the next morning. During this time, Ride Operators were expected to become sufficiently familiar with a ride specific Operating Procedure Manual, which for the TRRR, spanned some 18 pages. This level of training, as was highlighted by Professor Sanderson, was clearly inadequate, and led to extensive and necessary 'on the job' learnt behaviour as to how to operate the ride effectively.

1032. Whilst there is no suggestion that the Instructors charged with training new Ride Operators did so without the necessary due diligence, they were limited by the training they had been provided and the expectations placed on them with respect to the in-house training. Whilst the training Ms. Williams undertook on the morning of the tragic incident was clearly insufficient for the extensive tasks and functions she was required to perform, this was not due to any particular failing by Ms. Crisp. Rather, it was evidence of an inherent lack of proper training and process in place at Dreamworld to ensure the training provided to new Ride Operators and Instructors was suitable for the roles and responsibilities to be undertaken.

1033. Those responsible for managing the ride, whilst following the process and procedure in place, were largely not qualified to perform the work for which they were charged. Furthermore, the processes and procedures in place at Dreamworld seem to have been created by unknown persons, who it is safe to assume, lacked the necessary expertise. It seems that the practice at Dreamworld was simply to accept what had always been done in terms of policy and procedure, and despite change to safety standards and practices happening over time, only limited and largely reactionary consideration was ever given to making changes, which includes to the training provided to staff.

1034. The Operating Procedures in place in relation to the TRRR, which were supplemented by further memorandums, were extensive and confusing. An example of this was the use of the E-stop at the unload area, for which it was expressly stipulated that it was not be utilised unless in an emergency. There was no indication as to what constituted an 'emergency', nor were staff adequately trained or provided with sufficient authority and situational awareness to use the button when necessary. Furthermore, there were no emergency drills undertaken at the Theme Park, despite recurring recommendations from internal and external audits that this be undertaken. Had this been done, it may have reduced the stressors associated with responding to such traumatic events, and made such a response more effective.

1035. Regardless of the training provided at Dreamworld, it would never have been sufficient to overcome the poor design of the TRRR, the lack of automation and engineering controls. The responsibilities on the Ride Operators to respond to

various different situations and emergencies, as well as general operational duties, was clearly excessive and unsound.

Consideration of the regulatory environment and applicable standards by which Amusement Park rides operate in Queensland and Australia, and whether changes need to be made to ensure a similar incident does not happen in the future.

1036. While I accept the OIR submissions that they did undertake onsite auditing and that they were very pro-active with the industry generally concerning safety, the onsite auditing by the Regulator of amusement devices at Theme Parks in Queensland prior to this tragedy obviously did not pick up the dangerous state of the TRRR as described by the independent engineering experts and the OIR inspectors who came to the site after the tragedy. It is also evident from the basis of the extensions granted to Dreamworld for compliance with the annual renewal registration in 2016, that there was an unjustified trust held by the Regulator as to the sufficiency of the safety and maintenance systems in place to ensure the safe operation of the high-risk plant. Clearly, given the nature of this tragedy, and the surrounding circumstances, including the lack of record management, the absence of any meaningful hazard assessments or effective engineering oversight of these devices, this was simply not the case. During the inquest, Mr. Chan acknowledged that the Regulatory framework in place at the time of the incident in relation to amusement devices effectively expected Theme Parks to have developed and implemented safety management systems, including maintenance, operation, training and emergency control, with the qualified engineering and other staff to action it. This was not the case at Dreamworld, and should have been recognised by the Regulator had proper oversight of the industry been in place.

1037. In response to this finding, some of the parties raise the issue of "**hindsight bias".** I have previously rejected this argument. It ignores the Australian Standard prohibiting the creation of pinch points. It ignores the history of four previous incidents, extremely similar in nature. It ignores the well-known danger presented by the numerous and regular pump failures. This danger was well known to the Operators, with prescribed responses set out in the Operator's manuals.

1038. The experts cited by Ardent Leisure in support of the hindsight bias contention do not qualify as experts and are not independent. Indeed no independent expert engineering or other suitably qualified independent witnesses were called except by the Coroner. Those cited by Ardent were not sufficiently trained nor were any of them engaged to consider the design of the TRRR holistically. Modifications were made without much thought to the design of the ride, or other hazards such changes may create. Further, Mr. Tan, as the only engineer, had a number of responsibilities within the Park, and was moved to different positions at different times throughout his tenure with Dreamworld. These hazards were obvious, and were not identified as no-one was ever charged with conducting an appropriate hazard and risk assessment of the ride. The engagement of Mr. Cruz to commence a desktop review of the rides, further supports this lack of consideration and risk assessment of the rides.

1039. In terms of hindsight bias as to the hazards present in the ride, it is clear the while the maintenance and operational staff, as well as OIR inspectors who attended site over the years, may not have identified such hazards, this was not because

they were not 'obvious'. The experts made it clear that such hazards would have been obvious to someone suitably qualified, who was charged with conducting a holistic risk and hazard assessment of the TRRR. It was not the responsibility, nor should it have been, for any of these individuals to conduct such a hazard and risk assessment of the ride. This should have been a separate process to the daily maintenance and operation of the ride. Clearly, this was not the role of external auditors JAK, as was recognised by Dreamworld. Had a proper risk and hazard assessment been done, it is likely that such obvious hazards would have been identified. This was established and reiterated by the experts called by the Coroner.

1040. Submissions are made that there was a 30-year history of incident free operation of the TRRR. This submission ignores the four previous similar incidents. It is quite true no one was injured. This is more good luck than good management. One only has to recall Mr. Tan's email and the report concerning the 2001 incident, which said, in part, '***the push of the conveyor caused a compaction effect, resulting in the rafts being caught at the unload area and one raft flipping'.*** Mr. Tan's email several years later in 2014, concerning another similar incident, contained a salutary warning: - ***'This occurred on the rapid ride several years ago, and fortunately there was no injury except for property damage. I shudder to think if there had been guests on the rafts'.***

1041. It is concerning that despite the multiple compliance activities, including site visits, undertaken by the Regulator at Dreamworld between 2002 and 2016, the deficiencies identified as to the maintenance, inspection, risk assessments, record keeping and engineering oversight of these devices, was not detected. Furthermore, the risks and hazards associated with the TRRR, including the nip point, were not identified by any of the Inspectors, who at times had cause to inspect the ride. Whilst limitations as to the intended purpose of these inspections and attendance at the Theme Park is acknowledged, this failing raises concern as to the sufficiency of the qualifications and training provided to Inspectors responsible for auditing amusement devices.

1042. For older devices, like the TRRR, there is a significant concern as to the poor mechanical integrity of the device, with a lack of modern safety controls and automation, placing a significant and unfair burden on Ride Operators to compensate for these lack of basic safety measures. While newly manufactured and constructed amusement devices are generally engineered to higher standards with greater safety measures and safeguards built in, there is a need to ensure that such devices meet international technical standards, as well as those stipulated in Australia. It is essential that any difference in these standards are recognised and steps taken to ensure any shortfalls with a device manufactured internationally is managed.

1043. Although annual inspections of amusement devices is mandated by the Regulation, it is not a 'major inspection' of the device, and the enforcement and check of such an inspection has been seriously lacking in Queensland for some time. As was recognised in the BPR, a 'major inspection' should be carried out by a competent person who had formal engineering qualifications and experience, and needed to include an examination of all critical components of the amusement device, as well as the effective and safe operation. Such a person needed to be qualified to make recommendations about the severity of faults observed and the intervals at which inspections and repairs needed to be undertaken for the particular device. This was simply not the case at Dreamworld. Whilst each of the members of the E&T Department were

technically qualified and experienced to perform their roles, this did not extend to effectively and properly inspecting, maintaining and risk assessing the amusement devices they were attending. Whilst the evidence of each of these staff members shows that they performed their roles to the best of their abilities, it is clear that there was a broader systemic problem with the lack of qualified oversight of the procedures and practices in place by management.

1044. The extensive auditing by OIR carried out following the tragic incident with respect to the prescribed annual inspections, whilst proper, served to demonstrate the absence of adequate prior compliance activity undertaken by the Regulator. This commitment to in-depth auditing of amusement devices will need to continue under any proposed changes to the regulatory framework. It is essential that for the regulation of amusement device in Queensland to be effective and for owners to remain compliant, regular, ongoing and adequate auditing of all aspects of the safety systems in place at the Theme Park will need to be undertaken by the Regulator.

1045. Concern has been raised by the experts and SIA as to the lack of competent professional engineers with the necessary experience to effectively inspect amusement devices. OIR has stated that consultation will continue with industry stakeholders, Engineers Australia and BPEQ, as to ensure this issue is further progressed. Such steps will be necessary to ensure the effective compliance of the proposed safety case regime once it comes into effect.

1046. The move to self-regulation is fraught with danger. Self-interest and the drive to contain costs leads to the issues, which arose with the internally unqualified engineer, and the type of investigation undertaken by Mr. Polley. The Regulation lacked diligence in these matters.

1047. I accept the OIR, through their BPR and Industry Review, have taken steps to correct the short-comings revealed in the evidence as set out above, however, it has been necessary to draw attention to those matters by way of explanation for the cause of the tragedy. It is to emphasize there were multiple causes all of which must be recognised and addressed to prevent such a tragedy occurring again. I accept there has been a considerable effort put in by the OIR to address these issues.

1048. The OIR draws my attention to the difficulties arising when requiring all amusement devices to comply with Australian Standards. This difficulty is brought about by the fact that most amusement devices are designed and manufactured overseas, predominantly based on European standards. Of course, this was not the case with the TRRR. While I accept the obvious difficulties this may present, it could and should be overcome by initial and regular inspections when the devices are installed and operating in Australia. This will ensure that such rides comply with obvious standards, such as the Australian Standard to prevent nip points, like the extreme danger to passengers presented by the TRRR should the raft be tipped up or passengers fall out into the conveyor mechanism as was the case under consideration.

Mr. Polley's Conduct

1049. With respect to the inspections undertaken by Mr. Polley, and the subsequent annual plant renewal certification provided for the TRRR and other amusement devices at Dreamworld, it is concerning that this was done without the provision

of any documentation pertaining to the ride. That this limited the scope of Mr. Polley's engagement by Dreamworld is clear, and his failure to ensure that he was furnished with documentation relevant to his assessment, which is cited in the certificate issued, falls below the industry standards expected of an RPEQ, particularly those charged with inspecting amusement devices.

Changes Made at Dreamworld Following the Incident

1050. Since the tragic incident, significant changes have been made at Dreamworld, including the audit and inspection of the amusement devices by qualified Engineering firms, consideration of WHS practices, reviews of operating procedures, changes to the training regime with emergency drills being introduced, as well as the introduction of a safety management system to control safety risks. Whilst these steps are certainly positive, they serve to highlight, particularly given the established safety management systems in place at Village Roadshow, how rudimentary and deficient the safety management practices in place at Dreamworld were prior to this tragedy. Such a culpable culture can exist only when leadership from the Board down are careless in respect of safety. That cannot be allowed.

What further actions and safety measures could be introduced to prevent a similar future incident from occurring?

1051. Considering the circumstances of this tragic incident, it is clear that the recognised absence of adequate documentation and engineering controls challenged and contradicts any assumption that the annual ride inspections carried out by Dreamworld were a sufficient oversight mechanism (according to the Regulations) for the public safety of the ride.

1052. The transition to a safety case and licensing regime in Queensland, as detailed in the new Regulations, if enforced and audited regularly by the Regulator, will certainly be a more rigorous and hands-on regulatory approach to the Major Amusement Park industry. The requirement for a safety management system certainly appears to be a far more comprehensive and integrated approach to ensuring the effective management and control of risks with respect to amusement devices. It is undoubtedly a significant move away from the current self-regulatory nature of the industry. Given the circumstances of this tragic incident, it is without question that more direct oversight and regular auditing of the maintenance and inspection of amusement devices within the Theme Park industry is necessary. It was acknowledged by OIR that there needed to be a more holistic sign off with respect to amusement devices in Queensland, which will likely require the engagement by the RPEQ of other specialists. It is essential that there is regulatory oversight of this process to ensure compliance and that safety is being systematically managed by the Amusement Park. The proposed changes to the required competencies, training and instruction of those charged with operating amusement devices, as outlined in the draft Regulation, are necessary to ensure the safe operation of such a device.

1053. As was proposed by SIA, for this regime to be effective, spot checks of the annual and major inspections carried out by the competent person, particularly of high-risk rides, will need to be undertaken regularly by OIR. This will ensure consistency and sufficiency of the sign-off. It will be incumbent on the Regulator to ensure, through auditing and enforcement, that the approach taken by the RPEQ engaged by the owner of the high-risk plant to undertake such an

inspection, thoroughly considers the history, maintenance, safety and performance of the ride prior to certification. Those responsible for auditing the Theme Parks will need to have the requisite skills and knowledge to be able to effectively assess the suitability and sufficiency of the maintenance, inspection and safety programs in place. If there is no appropriate history, then the device should not be allowed to operate.

1054. From the draft Regulations provided, which are now in effect, it appears that the proposed safety case and license regime will require detailed information on how amusement devices will be maintained, inspected and tested to be submitted to OIR. Matters, such as the maintenance of amusement devices, would then be audited annually by the Regulator. It is this auditing oversight that will be necessary to ensure compliance by owners with the new regulatory framework. Until this event, there was an abject failure of obligation in this part of the Regulation.

1055. I note that Counsel for Ardent Leisure Limited raise objection to the scope of the inquest and any finding I make regarding the system of training in place at Dreamworld contributing to the incidents as inappropriate, wrong, and beyond the scope of the inquest. They also raise the same criticism of any finding relating to the lack of record keeping. This submission is interesting given the material willingly supplied by Ardent Leisure as to other rides within the Theme Park, supplemented by the extensive oral evidence volunteered by Ardent employees under extensive cross examination by all Counsel, including those appearing for Ardent Leisure. I reject this submission in so far as it is relevant as this evidence is clearly "connected to" and "relates to" the matters under consideration in this inquest. See *Doomadgee v Clements* [2006] 2 Qd R 352 per Muir J paras 30-33.

RECOMMENDATIONS IN ACCORDANCE WITH s.46

1056. Section 46 of the Act provides that a Coroner may comment on anything connected with a death that relates to:

a. public health and safety,

b. the administration of justice, or

c. Ways to prevent deaths from happening in similar circumstances in the future.

1057. Given the concerns raised in this matter and the evidence provided during this inquest, I make the following recommendations:

I. *OIR*

(a) Changes be made to the current regulatory framework in Queensland with respect to the inspection and licensing of Major Amusement Park devices to ensure that a more structured and compliance focused regime is implemented. Given the circumstances of this tragic incident, it is crucial that consideration is given to the following, when changes to the Regulation are considered:

- The requirement that owners of amusement devices utilise a safety management system to effectively manage and control

risks with respect to amusement devices.

- An owner of an amusement device must comply with the applicable updated Australian Standards.

- Annual risk assessments should be conducted by competent person/s and involve the detailed consideration of the device, including all possible control system functions and variations, as well as a detailed examination of the operation of the ride during all modes of operation and possible emergency conditions.

- The competency of those charged with operating an amusement device.

- The requirement of a major inspection or full risk assessment of the device by a competent person (RPEQ) at stipulated intervals, as suggested by the manufacturer or at a mandated duration (5 – 10 years).

- Regulations should make it clear of the onus placed on the RPEQ when conducting an annual inspection or a major risk assessment, which should include:

    i. The operation of the ride should be visually observed during a risk assessment.

    ii. Low probability failures need to be actively considered.

    iii. Observe how the machine handles adverse events. Run trial days where pumps are shut down, water levels decreased (or increased), rafts bottle neck, impact each other, to highlight weaknesses and expose hidden features of the design.

    iv. Consult Theme Park records internally and internationally.

    v. Consider whether the machine was fool-proof, and if not what engineering controls could be possibly utilised.

    vi. Look at design records.

- Regular auditing and oversight of such devices, as well as the associated inspections and required safety systems in place at the Major Amusement Park, must be conducted by the Regulator.

Whilst the safety case regime introduced by the recent amendments to the Regulations would appear to ensure this necessary regulatory oversight by way of a more mandated approach to the maintenance and inspection of amusement devices, it is essential that this be

monitored and maintained by way of regular and effective auditing. Such auditing should be undertaken by suitably qualified and trained OIR Inspectors. Major Amusement Parks in Queensland need to be required to implement effective control measures with respect to the devices in operation, and the Regulator must actively ensure this takes place.

Strict adherence to the timeframes proposed by the safety case and licensing regime in the draft Regulation should be maintained in order to ensure the expedited introduction of a more intense regulatory framework for Major Amusement Parks in Queensland and, most importantly, patron's safety.

(b) That OIR continue to develop a Code of Practice for the amusement device industry in Queensland, which will establish a minimum standard for the operation of amusement devices, in consultation with the requisite industry stakeholders, including the Amusement Device Working Group.

(c) That efforts to harmonise the requirements of the relevant design standards, particularly the critical safety requirements on amusement devices in Australia, Europe and America continue in consultation with relevant industry stakeholders.

(d) Steps be taken to rectify the lack of detailed knowledge of Safety Related Control Circuits held by the majority of OIR Inspectors.

II. *Other agencies*

(a) The Board of Engineers, in consultation with OIR and other industry groups, to continue efforts to address the shortfall in suitably qualified and experienced RPEQ's with respect to the inspection of amusement devices.

(b) That a reassessment of the Australian Standards applicable to waterborne rides (including raft rides) be undertaken to include some of the types of safety requirements associated with roller coasters, including more thorough considerations for lifts/elevators, collisions and passenger loading/unloading.

(c) Consideration as to whether the requirement for hazard identification and risk assessment in AS-3533.2 section 5.1 should be made mandatory. Furthermore, whether any modification or alteration to the ride should require hazard identification and risk assessment to ensure that changes made do not affect safe operation and use.

DISCRETION TO REFER IN ACCORDANCE WITH s.48 (4)

1058. Section 48 of the Act gives the Coroner discretion to refer information obtained whilst investigating a death, to give the information to the appropriate prosecuting authority, if the Coroner '*reasonably suspects a person has committed an offence*'.

1059. A referral can also be made pursuant to s.48 as to a person's professional conduct to the relevant professional disciplinary body if the Coroner reasonably believes the information might cause that body to inquire or take steps in relation to the conduct.

Referral of Ardent Leisure Limited to the OIR

1060. It is reasonably suspected that Ardent Leisure may have committed an offence under workplace law. Whilst various breaches of the WHS Act have previously been considered by OIR with respect to this incident, the details of which have been included in the inquest brief, given the significant further documentary material provided during the course of the coronial inquiry, and produced at inquest. I refer my Findings and the evidence gathered in the course of the Inquest to OIR for further consideration as to these matters. Whether there is sufficient evidence to proceed to prosecution is a matter for OIR.

Mr. Polley

1061. It is arguable that Mr. Polley's conduct in issuing the subsequent annual plant renewal certification for the TRRR and other amusement devices at Dreamworld, without any documentation pertaining to the ride being supplied by the Park and his failure to properly inspect the ride, was a failure, which falls below the industry standards expected of an RPEQ, particularly those charged with inspecting amusement devices. For this reason, I refer his conduct to the Board of Professional Engineers of Queensland.

I close the inquest

James McDougall
Coroner
Southern Region